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HIRATSUKA (N.). **Inoculation experiments with heteroecious species of the Japanese rust fungi. III.**—*Bot. Mag., Tokyo*, l, 592, pp. 213–216, 1936.

Continuing his inoculation experiments with heteroecious Japanese rusts [*R.A.M.*, xiii, p. 813], the writer transferred sporidia from the teleutospores of *Gymnosporangium amelanchieris* (also reported under the names of *G. idetae* [ibid., ii, p. 238] and *G. tremelloides* [ibid., iii, pp. 181, 255; iv, p. 398; vii, p. 33]) on *Juniperus rigida* twigs to the leaves of *Amelanchier asiatica* [*A. canadensis*] and a number of other Rosaceae with positive results in the case of the first named only, on which spermogonia began to appear 15 and aecidia 26 days after inoculation. The writer's studies are stated to afford no justification for the separation of *G. tremelloides* (or *G. idetae*) from *G. amelanchieris*. Similar experiments with *G. japonicum* from *J. chinensis* on *Photinia laevis* var. *villosa* and with *G. juniperi* from *J. rigida* on *Sorbus* [*Pyrus*] *aucuparia* were likewise successful.

HIRATSUKA (N.). **Uredinales collected in Kiushu (III).**—*J. Jap. Bot.*, xii, 4, pp. 265–272, 1936.

An annotated list is given of 41 Uredinales collected in Kiushu, Japan [cf. *R.A.M.*, xv, p. 401], of which the following may be mentioned: *Puccinia pruni-persicae* [ibid., xii, p. 248] and *Tranzschelia* [*P.*] *pruni-spinosae* [ibid., xv, p. 590] on peach; *Pucciniastrum castaneae* [ibid., xii, p. 726] on *Castanea crenata*; and *Phakopsora artemisiae* [ibid., vii, p. 405] on chrysanthemum. A Latin diagnosis is given of *Milesina tobinagai* n.sp. on *Woodwardia orientalis*.

LEPIK (E.). **On the fungus flora of Ruhnu (Runö) Island.**—*S.B. naturf. Ges. Jurjew*, xlii, 1–2, pp. 1–19, 2 graphs, 1 map, 1935. [Received June, 1936.]

The following are among the items of interest in this annotated list of the fungi observed by the writer during a stay on the island of Runö, south-west of Esthonia, in the Gulf of Riga, in 1934. Rust spores are borne by the wind from the mainland (nearest point 40 km. distant); among the rust species detected were *Puccinia lolii* on *Rhamnus cathartica* (all bushes of which were exterminated) [*R.A.M.*, xv, p. 400], *Melampsora lini* on flax, and *Gymnosporangium juniperinum* on *Sorbus*

[*Pyrus*] *aucuparia* [ibid., viii, p. 344]. *Lophodermium pinastri* occurs on pine needles [ibid., xv, p. 473] throughout the island.

BUHR (H.). **Pflanzengallen Mecklenburgs III.** [Plant galls of Mecklenburg III.]—*Arch. Ver. Naturg. Mecklenb.*, N.F., x, pp. 35–51, 1935. [Received July, 1936.]

An annotated list is given of the bacterial and fungal galls affecting plants and trees in Mecklenburg with Latin and German diagnoses of the one new species recorded—*Protomyces cirsii-oleracei* on *Cirsium oleraceum* [*Cnicus oleraceus*].

GADD (C. H.). **Diseases of the Tea bush. II. Root diseases.**—*Tea Quart.*, ix, 1, pp. 5–12, 1936.

In this further paper on tea diseases [cf. *R.A.M.*, xv, p. 321] the author describes in popular terms the symptoms, manner of occurrence, and mode of spread of root diseases with particular reference to those caused by *Poria hypolateritia* [ibid., xiv, p. 657], *Rosellinia arcuata*, *Fomes lamaensis* [*F. noxius*], *Armillaria mellea* [ibid., xiv, p. 14], and *Ustulina zonata* [ibid., x, p. 345]. The paper concludes with some general observations on the connexion between these diseases and the establishment of tea in jungle clearings, the rate at which fungi can kill tea bushes (*F. noxius* killing within a year and *P. hypolateritia* taking two or three years), and the distance from which their attack can be made.

SHEPHERD (E. F. S.). **A new disease of Tobacco, possibly of the virus type.**—*Leafl. Dep. Agric. Mauritius*, 40, 3 pp., 1 pl., 1936.

In a field of tobacco infected with mosaic in Mauritius, the author observed on 20th September 1935 a single plant showing an acute form of mosaic with severe mottling and marked distortion of the leaves, the pronounced development of marginal veins causing a puckering of the lamina 'as though a stitch had been run through the whole length of the leaf on each side'. Enations were strongly developed on the under surface. The disease was transmitted to healthy plants by an aqueous extract of dried infected material applied by a cotton wad. The affected field was abandoned by the grower, and as many of the plants developed the above-mentioned symptoms they were destroyed. In an addendum the author states that he thinks the disease may be a destructive form of tobacco mosaic [*R.A.M.*, xii, p. 538].

MATSUMOTO (T.). **Serological analysis of the infective agents causing Tobacco mosaic with malformed flowers.**—*Trans. nat. Hist. Soc. Formosa*, xxvi, pp. 258–261, 1 fig., 1936. [Japanese, with English summary.]

A peculiar malformation of tobacco flowers observed by the writer during his studies on virus diseases was ascertained by precipitin-absorption experiments to be due to a virus complex of which the two components are common tobacco and potato mosaic. The trouble is therefore identical with, or very closely related to, tomato streak [*R.A.M.*, xv, pp. 123, 406], caused by a combination of the tomato (tobacco) and potato mosaic viruses. Confirmatory results were given by inoculation experiments.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. VI. The isolation from diseased Turkish Tobacco plants of a crystalline protein possessing the properties of Tobacco mosaic virus.**—*Phytopathology*, xxvi, 4, pp. 305–320, 1 fig., 1936.

This is an expanded account of the writer's report on the isolation from diseased Turkish tobacco plants of a crystalline protein with the properties of the tobacco mosaic virus [*R.A.M.*, xv, p. 177], a preliminary note on which has already appeared from another source [ibid., xv, p. 404].

CALDWELL (J.). **Factors affecting the formation of local lesions by Tobacco mosaic virus.**—*Proc. roy. Soc.*, ser. B., cxix, 815, pp. 493–507, 1 pl., 3 graphs, 1936.

In this paper the author records a method of determining in inoculation experiments whether an inhibitor, which added to the virus inoculum has reduced or suppressed the formation of leaf lesions, is acting directly on the virus itself or on the host tissues (by reducing their susceptibility), or on both simultaneously.

By plotting concentrations of virus (abscissae) against the number of lesions formed (ordinates) a curve is obtained which at the lower concentrations is more or less a straight line, with a slope of 1, but at the higher tends to flatten out as there are no longer any susceptible areas available on the leaf and additional virus has no appreciable effect on the number of lesions produced. When an inhibitor is added which acts on the leaf tissues, but not on the virus, the curve becomes horizontal earlier than the curve for the untreated virus, whereas if the inhibitor acts on the virus only the original curve is displaced to the right.

Using tomato aucuba mosaic (Johnson's tobacco virus 6) and tomato ordinary mosaic (tobacco virus 1) and applying this method, the author shows that the inactivating effects of trypsin, silver nitrate, and normal rabbit or horse serum are due to action of these agents on the virus itself.

In conclusion, it is pointed out that if used with products of known reaction on proteins and other substances this method furnishes a means of studying the chemical nature of the virus agent itself.

SAREJANNI (J. A.) & STAMATINI (N.). **Le Phytophthora du Tabac en Grèce.** [The Tobacco *Phytophthora* in Greece.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 51–56, 1 pl., 1935. [Received July, 1936.]

Infection of tobacco by *Phytophthora*, first observed by the junior author in Macedonia in 1930, but thought very probably to have been present there and in Asia Minor before the war, produced three types of disease in Greece: (1) seedling damping-off, (2) a general wilt of the leaves, and (3) brown, necrotic, interveinal spots on the leaves. The causal organism was identified as *P. parasitica nicotianae* [*R.A.M.*, xiv, pp. 608, 743]. Satisfactory control was obtained in tobacco seed-beds by watering the soil with formalin solution (1 in 50) applied at the rate of 5 l. per sq. m. Also, when seedlings from infected beds were subjected to immersion in 1 per cent. Bordeaux mixture only 2 per cent. developed

infection, as compared with 10 per cent. in the untreated controls, the amount of injury resulting from the treatment being entirely negligible.

SMITH-WHITE (S.), MACINDOE (S. L.), & ATKINSON (W. T.). **Resistance of Nicotiana species to blue mould (Peronospora tabacina Adam).** —*J. Aust. Inst. agric. Sci.*, ii, 1, pp. 26–29, 1936.

Tests (in heated and unheated glass-houses) of resistance to *Peronospora tabacina* [*R.A.M.*, xv, p. 121 and next abstracts] by over 250 varieties and strains of *Nicotiana tabacum*, 21 varieties of *N. rustica*, and a number of introduced and native species of *Nicotiana* in New South Wales indicated that some geographical groups of *N. tabacum* varieties showed a slight relative tolerance, and that *N. rustica* showed rather more tolerance, though this was not high and was of doubtful value in breeding. No resistance greater than that of *N. rustica* was found in the introduced species, though some of these if more compatible with *N. tabacum* may be useful in breeding work. Preliminary results with five native species indicated that high resistance or even immunity might be expected in Australian forms; of these five, the 24-chromosome species *N. debneyi* is most likely to be of value in breeding as it most closely corresponds to the American species in morphological characters. It is significant as indicating the possible origin of *P. tabacina* that the native Australian species tested were all more resistant than the introduced ones.

HENDERSON (R. G.). **Effect of nutrients on susceptibility of Tobacco plants to downy mildew.**—Abs. in *Phytopathology*, xxvi, 2, p. 94, 1936.

In sand-culture experiments, tobacco plants grown in solutions low in nitrogen or high in potassium were very susceptible to downy mildew [*Peronospora? tabacina*: see preceding and next abstracts], whereas considerable resistance was shown by those receiving little potassium and a fair supply of nitrogen. In outdoor beds the disease usually appears first on stunted plants and on those growing near old stumps where a deficiency of nutrient elements may be expected.

HENDERSON (R. G.). **Promising fungicides for Tobacco downy mildew control.**—Abs. in *Phytopathology*, xxvi, 2, p. 94, 1936.

Good control of downy mildew [*Peronospora? tabacina*] on greenhouse and outdoor tobacco [see preceding abstracts] is stated to have been given by spraying with cuprous oxide (1 lb. to 100 galls. water) and benzoic acid ($\frac{1}{4}$ lb. to 100 galls.), with the addition in each case of 1 per cent. cottonseed oil emulsion. Linseed oil and benzoic acid also gave satisfactory results in one trial, while picric acid was less effective and injured the foliage.

HILL (A. V.). **Cercospora leaf-spot (frogeye) of Tobacco in Queensland.** —*Bull. Coun. sci. industr. Res. Aust.* 98, 46 pp., 7 pl., 6 graphs, 1936.

A tabulated account is given of the writer's studies on frog-eye of tobacco (*Cercospora nicotianae*) in Queensland [*R.A.M.*, xiv, p. 425; xv, p. 121]. In addition to information already presented in this *Review*

from other sources, the following facts are of interest. Evidence is adduced to show that *C. raciborskii* Sacc. & Syd. [ibid., xiii, p. 657] and *C. solanicola* Atk. [ibid., xiv, p. 87] are morphologically indistinguishable from *C. nicotianae* E. & E., and should therefore be regarded as synonyms of the last named on grounds of priority. Twelve species of *Nicotiana*, *Datura stramonium*, and *Nicandra physaloides* contracted frog-eye symptoms following inoculation in the greenhouse with a conidial suspension of *C. nicotianae* or with fragments of mycelium from agar cultures, the latter method only being successful in the cases of tomato, eggplant, chilli (*Capsicum annuum*), and three species of *Solanum*. Several plants of *D. stramonium* in a tobacco field were found to be partially defoliated in 1934 by a species of *Cercospora* which produced the typical frog-eye lesions on tobacco seedlings inoculated in the greenhouse.

Valleau (W. D.) & Johnson (E. M.). **Physalis subglabrata : a natural host of Bacterium angulatum.**—*Phytopathology*, xxvi, 4, pp. 388–390, 1936.

Smooth ground cherry (*Physalis subglabrata*) plants growing at a distance from tobacco at the Kentucky Agricultural Experiment Station were found to be extensively infected by the angular leaf organism (*Bacterium angulatum*) [*R.A.M.*, xv, p. 179], which was isolated from 37 out of 39 examined, as well as from one of clammy ground cherry [*P. heterophylla*], and inoculated with positive results into tobacco. *Bact. angulatum* was also isolated from flea beetles [*Epitrix parvula*] which feed on *Physalis* in the spring and later migrate to tobacco, often causing severe injury, and from garden flea hoppers [*Halticus citri*]. *Bact. angulatum* and *Bact. tabacum* both survive the winter on tobacco refuse in the open, and there is no reason to suppose that *Physalis* foliage does not serve the same purpose. The evidence here presented seems at any rate sufficient to implicate *P. subglabrata* as one of the means of dissemination of *Bact. angulatum*.

McIlvaine (T. C.) & Garber (R. J.). **Inheritance of resistance to root rot in Tobacco caused by Thielavia basicola.**—*J. Amer. Soc. Agron.*, xxviii, 4, pp. 279–283, 1 fig., 1936.

For some years past attempts have been in progress at the West Virginia Agricultural Experiment Station to develop by hybridization and selection a strain of Burley tobacco resistant to root rot (*Thielavia* [*Thielaviopsis*] *basicola*) [*R.A.M.*, xv, pp. 178, 536]. In this connexion data (based on the correlation between the disease and dwarfing) are presented and briefly discussed which indicate that resistance to root rot is heritable as a dominant or partially dominant character [ibid., i, p. 93].

Moore (E[nid] S.) & Smith (A. J.). **Pests and diseases in Tobacco seedbeds.**—*Fmg S. Afr.*, xi, 121, pp. 135–138, 9 figs., 1936.

Popular notes are given on the following diseases of tobacco in South Africa: damping-off (*Pythium* and *Rhizoctonia* spp. and other organisms), black root rot (*Thielavia* [*Thielaviopsis*] *basicola*) [see preceding abstract], wildfire (*Bacterium tabacum*), angular leaf spot (*Bact.*

angulatum), mildew (*Erysiphe cichoracearum*) [ibid., xv, p. 469], *Fusarium* wilt [*F. oxysporum* var. *nicotianae*: ibid., xiv, pp. 85, 126], mosaic [ibid., xiv, p. 474], leaf curl, and kromnek [ibid., xv, p. 425].

PAGUIRIGAN (D. B.), TUGADE (P.), & DE PERALTA (F.). **Progress report on the green-leaf spot of Philippine wrapper leaf Tobacco.** —*Philipp. J. Agric.*, vii, 1, pp. 87–117, 1 col. pl., 1 fig., 2 graphs, 1936.

The green leaf spot of wrapper tobacco, which has caused severe damage in the Philippines of recent years [*R.A.M.*, viii, p. 635], has been found to be due to the premature death of the cells associated with high temperatures and excessive atmospheric humidity such as are apt to develop among plants grown under abacá cloth shade. The rapid transpiration of the thin, non-cutinized leaves produced under these conditions involves the protoplasmic dehydration and ultimate destruction of the tissues. The trouble may be minimized by harvesting the leaves when there is no moisture film on their surfaces, and by maintaining the temperature of the curing house during the first week (i.e., until the foliage begins to turn brown) at 27° C. with a relative humidity of 75 per cent.

NEERGAARD (P.). **Virussygdomme paa Tomat.** [Virus diseases on Tomato.]—Reprinted from *Gartnertidende*, *1936*, 8, 11 pp., 3 figs., 1936.

A tabulated account is given of the symptoms, geographical distribution, mode of transmission, and alternate hosts of the following virus diseases of the tomato, with bibliographical references: ordinary mosaic (tobacco virus 1) [*R.A.M.*, xv, p. 181], yellow mosaic (tobacco virus 6) [ibid., xiv, p. 660; xv, p. 533], mixed virus streak (either tobacco virus 1 or 6 or tomato streak virus 1+potato virus X, or tobacco virus 1+spotted wilt) [ibid., xiv, pp. 261, 661; xv, p. 123], stem necrosis streak (tobacco virus 9) [ibid., xv, p. 182], bunchy top [ibid., xi, p. 481; xv, p. 182], delphinium stunt [ibid., xiii, p. 638], ring mosaic streak [ibid., xv, p. 182], single virus streak (streak virus 1) [ibid., xiv, p. 261], mosaic (potato virus X = healthy potato virus = latent virus and virulent latent virus) [ibid., xiv, p. 661], spot necrosis (potato rugose mosaic virus = 'veinbanding' virus+potato virus X) [ibid., xi, p. 595], 'veinbanding' ('veinbanding' virus, probably identical with potato virus Y) [ibid., xiii, p. 463], fern-leaf (cucumber virus 1) [ibid., xiv, pp. 83, 218, 681; xv, p. 264], spotted wilt [ibid., xv, p. 444], psyllid yellows [ibid., xiv, p. 117], leaf roll or curly top (sugar beet curly top virus) [ibid., xv, p. 123], big bud [ibid., xv, p. 182], and witches' broom (potato witches' broom virus) [ibid., viii, p. 679]. Of these diseases, only mosaic, streak, and fern-leaf are definitely known to occur in Denmark [ibid., x, p. 704].

HOWELLS (D. V.). **Phytophthora disease of Tomatoes (toe rot).**—*Scot. J. Agric.*, xix, 1, pp. 47–50, 3 pl., 1936.

For a number of years tomatoes in many glass-houses in Scotland have been affected by a very troublesome root rot chiefly affecting the tip of the main root and caused by an unnamed species of *Phytophthora*

differing considerably from *P. cryptogea* and *P. parasitica*, both of which have also been isolated from affected plants. The first record was in Lanarkshire in 1929, but the disease has since occurred in eight other counties and presents a serious menace to the industry. It appears in seedlings in pots and after the tomatoes have been set out in the borders. Detection while the plants are in the seed-boxes is difficult, as only those with blackened or destroyed roots are recognizably infected; in the pots the presence of infection may be masked. In all cases the immediate source of infection is the soil, spread usually taking place by means of infected plants.

Affected plants wilt by day but revive at night. The leaves and stem are dark green to dark blue, the under-surfaces of the former often being purple. The leaves are poorly developed and pointed, and the stem is thin and hard. The root core is generally brown and hard, while in severe cases the central root is dead and dry, with a curiously pointed tip. The new rootlets formed are attacked in turn.

The control measures recommended consist in discarding all the seedlings in any seed-box affected; all suspicious pot seedlings should be examined while young, and if affected, either burnt or the main roots cut away to about half an inch above the level of the decay, after which re-potting should be effected and the plants watered with a solution of mercuric chloride (1 oz. per 20 galls.), nitrate of potash (1 oz. per 2 galls.) being applied two days later.

HUELSEN (W. A.). **New wilt-resistant Tomatoes for Illinois.**—*Canning Tr.*, lviii, 35, pp. 10–12, 1936.

Notes are given on the yield data and other features observed from 1930 to 1935 in connexion with the development at the Illinois Agricultural Experiment Station of the wilt- (*Fusarium*) [*bulbigenum* var. *lycopersici*] resistant tomato varieties, Prairiana, Early Baltimore, and Illinois Pride, all of which have been released to the public for cultivation in the field [cf. *R.A.M.*, xiii, p. 218].

SCHWERDTFEGER (F.). **Die wichtigeren forstpathologischen Arbeiten des Jahres 1935. Kritische Übersicht.** [The outstanding studies on forest pathology of the year 1935. A critical survey.]—*Forstarchiv, 1936*, 9, pp. 142–148, 1936.

The writer concisely summarizes the outstanding literature of 1935 on silvicultural pathology in Germany and some neighbouring countries. Most of the relevant phytopathological material has been noticed from time to time in this *Review*.

BUISMAN (CHRISTINE). **De resistente Iep Nr 24.** [The resistant Elm No. 24.]—*Tijdschr. ned. Heidemaatsch.*, xlviii, 2, pp. 73–76, 1936.

Particulars are given of the growth habit, constitution of the wood, and other points of interest in connexion with selection No. 24 of *Ulmus foliacea*, which has given ample evidence of resistance to *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xv, p. 542] in variety trials in different parts of Holland and is being propagated for commercial distribution. Apart from a few minor disadvantages, No. 24 is considered to be a

valuable addition to the material available for breeding for immunity from the elm disease.

ARNAUD (G.) & BARTHELET (J.). **Le nérume ou pourriture noire des Châtaignes (Sclerotinia pseudo-tuberosa et Rhacodiella castaneae).** [Nerume or black rot of Chestnuts (*Sclerotinia pseudotuberosa* and *Rhacodiella castaneae*).]—*Ann. Epiphyt.*, N.S., i, pp. 121–146, 10 figs., 1936.

In this account of their investigations into black rot of chestnuts (*Sclerotinia pseudotuberosa*) [*R.A.M.*, x, p. 696] the authors give a detailed description of the microconidial (*Rhacodiella castaneae*) and apothecial stages, the latter being obtained only in culture. The microconidial form is of the same type, but specifically distinct from those of other species of *Sclerotinia*; but in its extreme variability *R. castaneae* presents analogies with the microconidial forms of other groups of fungi belonging to widely separated genera in which the microconidia have wrongly been considered to be endogenous. The genus *Rhacodiella* itself is considered as only slightly distinct from *Endoconidium*. A list is given of Discomycetes found on the chestnut, notes being added on *Phoma endogena* [ibid., viii, p. 614] and species of *Melanospora* found on this host.

The disease is prevalent on the silica soils of the Massif Central and Cévennes regions of France and probably is also present in the forests near Paris; it also occurs in Italy, where it is known as 'nerume'. In the vicinity of Versailles no diseased nuts were found in 1935 during the normal fall in October, but 30 per cent. of the nuts left on the ground until December were infected. As there are usually no external symptoms selection during gathering is impracticable. It would appear to be advisable to collect the nuts as they fall and store them in a cold, relatively dry place.

[A shorter version of this paper appears in *C.R. Acad. Agric. Fr.*, xxii, 2, pp. 48–51, 1936.]

PAVARI (A.). **Il Castagno giapponese (Castanea crenata Sieb. et Zucc.).** [The Japanese Chestnut (*Castanea crenata* Sieb. & Zucc.).]—*Alpe*, xxii, 11–12, pp. 381–389, 6 figs., 1935.

An account is given of the botanical characters of the Japanese chestnut (*Castanea crenata*), of its introduction into Europe with a view to replacing the losses in the indigenous *C. sativa* plantations destroyed by ink disease (*Phytophthora cambivora*) [*R.A.M.*, xv, p. 540], and of Italian experience in its value for this purpose. Two lines of experimentation are in progress, namely, the grafting of the Japanese on the native varieties and vice versa, and the cultivation of the former direct from seed. The first method is stated to be giving satisfactory results, e.g., in the forest of Vallombrosa, while in regard to the second project, success is limited by the exacting requirements of the exotic species in respect of climatic and soil conditions and the like. The nuts of the Shiba variety are small and suitable only for fodder, whereas those of Tamba are large and sweet.

MARIANI (G.). **Il Castagno giapponese in Provincia di Cuneo.** [The Japanese Chestnut in the Province of Cuneo.]—*Alpe*, xxiii, 1–2, pp. 5–8, 6 figs., 1936.

Practical recommendations are made for the grafting of scions of the native Italian chestnut varieties [*Castanea sativa*] on Japanese stocks [*C. crenata*] in connexion with the campaign against ink disease (*Blepharosphora* [*Phytophthora*] *cambivora*) [see preceding abstract].

MILLER (P. W.). **Filbert blight and its control.**—*Ext. Bull. Ore. agric. Coll.* 486, 8 pp., 8 figs., 1936.

Filbert [*Corylus avellana*] bacterial blight (*Phytomonas* sp.) [? *Bacterium juglandis*: *R.A.M.*, xiv, p. 204] occurs in the United States only in the States of Oregon and Washington, where in two- to four-year-old orchards the disease frequently kills 10 to 25 per cent. of the trees. The roots and nuts are not affected, but the yield may be reduced by the death of numerous buds (both leaf and pistillate), twigs, and branches. The most serious aspect of the disease, however, is the formation of cankers on the larger branches and trunk, particularly when the cankers girdle and kill the trees. Angular to irregular, reddish-brown dead spots appear on the leaves, but premature defoliation is not usual. On shoots of the current season's growth the first sign of infection is often seen near an old diseased bud scale at the base of the shoots where dark green, water-soaked areas, later turning reddish-brown, are developed. Infection of one-year-old twigs takes place indirectly through wounds or from blighted buds and diseased shoots of the current season's growth.

The bacterium overwinters in the branch and trunk cankers, and the chief natural agent of spread is atmospheric moisture, though pruning and suckering implements also play a part, infection generally occurring in late spring and early summer.

Studies over a period of four years indicated that some measure of control is obtained by removing all detectable sources of infection before the autumn rains set in and preferably at midsummer. All pruning implements and pruning wounds should be properly disinfected. Evidence was obtained that the incidence of the disease is appreciably reduced by spraying during autumn with Bordeaux mixture 4–4–50, just before the leaves fall. A similar application in late winter or early spring when the leaf buds are in the early green-tip stage is also of some value.

Of the more important commercial varieties Barcelona, Du Chilly, White Aveline, and Brixnut are those most severely attacked, Daviana and Bolwyller being considerably resistant.

JØRSTAD (I.). **Melding om soppsykdommer pa skogtraerne i arene 1931–1935.** [Report on fungous diseases of forest trees in the years 1931–1935.]—*Beretn. norsk. Skogv., 1935*, pp. 83–100, 1936.

Notes are given on the diseases of forest trees observed in Norway from 1931 to 1935 [cf. *R.A.M.*, xi, p. 136]; the following are among the many items of interest. *Cronartium flaccidum* (*Peridermium pini* var. *corticola*) [ibid., xii, p. 406 and next abstract] was prevalent in a number of northerly localities, occurring in a severe form in 1933 in a ten-year-old

French mountain pine [*Pinus montana gallica*] plantation in the vicinity of a freshly infected common pine [*P. sylvestris*]. White currants (Dutch Grape), *Ribes aureum*, and *R. sanguineum* were attacked in nurseries by *Cronartium ribicola*, but the common red currant (Viking) [ibid., xiv, p. 377] is immune.

There is reason to believe that *Crumenula pinicola* [ibid., xiii, p. 665] assumes two forms on pines, a definitely parasitic one in which the conidial stage (*Brunchorstia pinea*) predominates, and a milder phase associated chiefly with the perfect stage. *Thecopsora areolata* [ibid., xv, p. 411] occurred in an epidemic form on plums in eastern districts in 1935; it does not, however, produce teleutospores on the leaves of this host, so that basidiospores from overwintered bird-cherry [*Prunus padus*] foliage constitute the main source of spruce infection. *Chrysomyxa pyrolae* [ibid., xi, p. 214] var. *pyrolata* (Schw.) Jørst. has been observed to form two uredo generations on *Pyrola secunda* but only one on other *P.* spp., of which *P. minor* is the most commonly parasitized by the rust in Norway. *C. abietis* [ibid., xv, p. 411] was more prevalent than usual both in 1931 and 1934 in Telemark and caused extremely heavy damage to the current year's needles in Sør-Trøndelag in 1935. In 1934 the rust was also found on *Picea sitchensis* (a new host for Norway). *Ascochyta piniperda* [ibid., xii, p. 667], not hitherto reported from Norway, was observed in company with *Rhizosphaera pini* [ibid., viii, p. 275] on dead spruce needles in Leinstrand in 1935 and on those of *P. pungens* at an altitude of 850 m. above sea-level in Ringebu in 1934.

The most extensive damage to larches from *Dasyscypha willkommii* [ibid., xv, p. 131] occurs on the west coast, where all varieties are affected. The saprophyte *D. calycina* [ibid., xiv, p. 264], generally coextensive with *D. willkommii*, was found alone in a European larch planting in Stor-Elvdal.

Three-year-old nursery plants of *Abies lasiocarpa* were affected by girdling due to *Pestalozzia hartigii* [ibid., xi, p. 80], which also caused needle discoloration of a fully grown pine, both records dating from 1934.

The aspen rust, *Melampsora tremulae*, is stated to consist of four 'races', all with different alternate hosts, viz., *M. pinitorqua* [ibid., ii, p. 529: vi, pp. 201, 701; xiv, p. 663] on pine, *M. laricis* [*M. larici populina*: ibid., xiv, p. 464] on larch, *M. rostrupii* [ibid., x, p. 418] on *Mercurialis perennis*, and *M. magnusiana* Wagn. on *Chelidonium majus* and *Corydalis*. Aspens and pyramid poplars [*Populus nigra* var. *pyramidalis*] are commonly attacked by scab (*Venturia populina* or *V. tremulae*) [ibid., xv, p. 328], which was also observed on *P. alba*. *Pseudopeziza populorum* (*Marssonina populi-nigrae*) was a frequent agent of defoliation in *Populus nigra* and was further detected on *P. berolinensis* in a nursery.

Uncinula tulasnei is prevalent on Norway maples [*Acer platanoides*] and causes considerable damage in nurseries [ibid., xi, p. 136]. *U. bicornis* was occasionally observed on sycamores [*A. pseudoplatanus*] and *A. campestre*. Limes [*Tilia*] in nurseries are subject to severe injury by *Pyrenochaeta pubescens* [ibid., xiii, p. 10]. Birches were attacked in 1931 by *Diaporthe aristata* [ibid., xi, p. 136]. The *Oidium* stage of a

fungus apparently identical with *Microsphaera alphitoides* [*M. quercina*: ibid., xv, p. 473] was observed on beech seedlings, a new host for the organism in Norway.

Notes are also given on the wood rots of soft and hardwoods caused by a number of well-known Basidiomycetes.

Mathiesen (A.). **Männikoore-pôletik kui tôbi, mida meil tuleb mônes metskonnas tôsiselt arvestada.** [Pine blister rust as a disease demanding serious consideration in certain silvicultural areas.]—*Mitt. Lehr-VersReviers Univ. Tartu* 2, pp. 123–157, 9 figs., 1935. [Esthonian, with German summary.]

Blister rust of pines (*Peridermium pini* f. *corticola*) [see preceding abstract] is stated to be particularly severe in Esthonia in 20- to 50-year-old stands, in which both vigorous and sickly trees are equally liable to attack. Poverty of the soil may also permit infection in younger trees, which the fungus enters chiefly through the sites of insertion of the lateral branches. The extension of the disease frequently coincides with epidemics of the bark beetle (*Myelophilus piniperda*) and pine moth (*Fidonia piniaria*) [*Bupalus piniarius*]. The rupture of the spore layers takes place in the middle of June, and by the autumn of the same year the entire top of the young tree from the place of infection upwards is withered. The rust attacks the trunks as well as the branches. Control measures should include the timely eradication of diseased trees and the cultivation of mixed stands, birch and alder being suitable for this purpose under local conditions.

Terrell (A. B.). **Larch canker.**—*Quart. J. For.*, xxx, 2, pp. 158–160, 1936.

Larch trees growing in two plantations (one on chalk and the other on tertiary clay soil) in Hampshire and badly infected by canker [*Dasyscypha calycina*: see preceding page] were treated by cutting off and burning the diseased branches and dressing the wounds on the trunks with coal-tar. At the same time measures were taken to ameliorate the condition of the trees by extermination of rabbits, thinning, and underplanting. In both sites the larches rapidly recovered from the disease.

Stickel (P. W.) & Marco (H. F.). **Forest fire damage studies in the north east. III. Relation between fire injury and fungal infection.**—*J. For.*, xxxiv, 4, pp. 420–423, 1 fig., 1936.

Periodical inspections of burnt-over forest areas in the north-eastern United States have shown that infection by wood-destroying fungi takes place so rapidly after a fire [cf. *R.A.M.*, xv, p. 409] that the speedy removal of all butt-scorched trees is a sound silvicultural practice. Generally speaking, not more than two growing seasons should be allowed to elapse between fire injury and felling. Within three years after a fire the percentages of infected living trees in the red spruce (*Picea rubra*) and scarlet, black, and chestnut oak (*Quercus coccinea*, *Q. velutina*, and *Q. montana*) cover types inspected were 28 and 45, respectively, the corresponding figures for rot in dead trees being 29 and 18 per cent., respectively.

Of the fungi concerned in the infections only one, *F. igniarius* var. *laevigatus*, is a true heartwood-rotting fungus, infection by which presumably occurred previous to the fire. The path followed by the organisms generally coincides closely with the outlines of the bark discoloured by fire.

GRAFF (P. W.). **North American Polypores. I. Polyporus squamosus and its varieties.**—*Mycologia*, xxviii, 2, pp. 154–170, 1936.

The author discusses the distribution of *Polyporus squamosus* [*R.A.M.*, xiv, p. 794] in North America (where in contrast with its prevalence in Europe, it is rare), lists and also discusses the synonymy of the fungus, and gives notes on three readily distinguishable varieties, *P. squamosus* var. *polymorphus* (Bull.) comb. nov., found in England and France, *P. squamosus* var. *glaber* (Batt.) comb. nov., rare in New York, Pennsylvania, Ohio, and Europe, and *P. squamosus* var. *fagicola* (Murr.) comb. nov. found in Maine and New York.

McCORMACK (HELENE W.). **The morphology and development of Caliciopsis pinea.**—*Mycologia*, xxviii, 2, pp. 188–196, 2 pl., 1936.

Caliciopsis pinea Peck occurs in smooth, depressed cankers (which it apparently causes) on the trunks and branches of *Pinus strobus* and other coniferous hosts, abundantly in New York, and not uncommonly throughout the north-eastern United States. In the cortical tissues it forms small, cushion-shaped stromata, which rupture the bark and assume a lobed appearance, the lobes developing into spermogonia and ascocarps.

The black, pycnidium-like spermogonium, 100 to 150 μ in diameter at maturity, is filled with rod-shaped to allantoid, hyaline or slightly yellowish, single-celled spermatia, 2·5 to 3·5 μ in diameter. The mature ascocarp is a stromatic column, 1·75 to 2·5 mm. high, with an apical or sub-apical enlargement containing a single ascigerous locule, and with a dull to shiny, coriacious surface that becomes gelatinous when moist; occasionally the column is branched and it is often swollen at the base, where spermogonia are frequently clustered. The ovate asci measure 12 to 19 by 5 to 8 μ, have long slender stalks, and contain eight small, ellipsoidal to nearly globose, golden-brown ascospores which are freed by the deliquescence of the wall and pushed out through the opening, giving the tip of the column a reddish-brown, fuzzy appearance. Full descriptions are given of the development of the spermogonium and ascocarp. The author regards the genus as belonging to the Pyrenomycetes, falling near the Coryneliaceae [cf. *R.A.M.*, x, p. 753].

MILLER (J. H.) & WOLF (F. A.). **A leaf spot of Honey Locust caused by a new species of Linospora.**—*Mycologia*, xxviii, 2, pp. 171–180, 2 figs., 1936.

A description is given of a fungus widely prevalent in the southern United States on *Gleditsia* [*Gleditschia*] *triacanthos* and hitherto commonly designated as *Melasmia hypophylla*. The authors show, however, that the conidial stage is an acervulus of the *Gloeosporium* type and not a pycnidium; it may be recognized by the presence of numerous, flat, black, subcuticular fructifications on the lower leaf surface. The

oblong, straight, or slightly curved conidia measure 3 to 5 by 1 to 1·5 μ. The perithecial stage develops in infected leaves in moist places under the trees, the blunt cylindrical beaks projecting usually from the upper surface. Paraphyses are present, but those interspersed with the asci are digested and disappear as the asci mature. The asci are cylindrical, straight or curved, with no stipe, with a thickened apical wall and tubular pore, and measure 80 to 110 by 10 to 15 μ. The filiform, hyaline ascospores measure 70 to 90 by 3 μ. The bases of the asci are readily soluble in water, and in free hand sections the entire mass of asci separates. The fungus is regarded as a new species of *Linospora* and is named *Linospora gleditsiae* n.sp., with a Latin diagnosis of perithecial and conidial stages.

Spradling (Mae). **Penetration of Trichoderma lignorum into sapwood of Pinus taeda.**—*J. agric. Res.*, lii, 7, pp. 541–546, 1 fig., 2 diags., 1936.

The results of the experiments briefly discussed in this paper showed that *Trichoderma lignorum* (which is stated to have been frequently isolated by the author from the interior of wood) was able to penetrate through natural openings of the wood into both steamed and unsteamed sapwood of *Pinus taeda*, its advance in steamed wood being about four times more rapid than in the unsteamed. At the end of the test the hyphae of the fungus were most numerous in the ray parenchyma and the wood tracheids, but they also were present in the ray tracheids and resin ducts. No significant difference in rate of penetration was found between the cellulose-dissolving and the non-cellulose-dissolving strains of the fungus which were tested, and the difference in moisture content between the steamed and unsteamed wood did not appear to be the cause of the difference in the rate of advance in them.

Scheffer (T. C.) & Lindgren (R. M.). **The effect of steaming on the durability of unseasoned sap-gum lumber.**—*J. For.*, xxxiv, 2, pp. 147–153, 1 fig., 1 graph, 1936.

Preliminary steam treatment of sap-gum (*Liquidambar styraciflua*) timber as practised in certain sawmills, involving 6 to 35 hours' exposure to temperatures ranging from 150° to 190° F., was experimentally shown to reduce the resistance of the unseasoned wood to *Polyporus* [*Polystictus*] *versicolor* [*R.A.M.*, xv, p. 186] under controlled laboratory conditions. The increased susceptibility to decay occasioned by steaming became more pronounced with each progressive test period, and the rate of decay was more uniform in the treated than in the untreated wood. Some practical recommendations for obviating the deleterious results of steaming are given.

Findlay (W. P. K.). **Influence of certain calcium compounds on the rate of decay of wood by fungi.**—*J. Soc. chem. Ind., Lond.*, lv, 16, pp. 103T–105T, 1936.

Using the standardized wood-block method for the testing of timber preservatives [*R.A.M.*, xv, pp. 133, 333], the writer investigated the effects of the introduction of certain calcium compounds [ibid., xv,

p. 131 and next abstract] on the rate of decay of Scots pine (*Pinus sylvestris*), beech, and oak by certain fungi.

Neither saturated lime-water nor 0·5 per cent. calcium acetate exerted any detrimental action on the strength of the wood; on the contrary, the growth of *Merulius lacrymans* and (to some extent) that of *Poria vaporaria* in Scots pine was checked by these treatments, which were without apparent effect on *Coniophora cerebella* [*C. puteana*] and *Lentinus lepideus* [ibid., xv, p. 332]. There was no difference between the beech blocks impregnated with lime-water and the untreated controls in respect of the incidence of decay by *Polystictus versicolor*. On the other hand, the oak heartwood blocks treated with lime-water or 1 per cent. calcium acetate showed significantly more decay by *P. versicolor*, *Stereum hirsutum*, and *Phellinus* [*Fomes*] *cryptarum* than the controls, presumably on account of the neutralizing action of the lime on the tannin [ibid., xiv, p. 543] which normally repels wood-destroying organisms or confines them to the sapwood.

Discussing the practical conclusions arising out of these studies, the writer points out that it is against the access of moisture, not of lime, to structural materials that precautions should be taken in building. Only in the case of oak may lime infiltrations lessen resistance to fungal decay.

McLachlan (T.). **Influence of calcium in the decay of wood.**—*J. Soc. chem. Ind., Lond.*, lv, 17, p. 329, 1936.

The writer obtained from Dr. Rudge pure cultures of *Fomes annosus*, *Lentinus lepideus*, *Polystictus versicolor*, and *Coniophora cerebella* [*C. puteana*], and grew them on calcium carbonate-malt agar with an original hydrogen-ion concentration of P_H 7·5, which is rapidly changed by the organisms to P_H 3·5 or 4. Modern concretes, cements, and lime-washes are stated to contain less free lime (which in contrast to calcium carbonate exerts an inhibitory effect on most wood-destroying fungi) [see preceding abstract] than formerly, hence their failure to repel decay.

Schmidt (E.). **La conservation du bois.** [Wood preservation.]—*Nature, Paris, 1936*, 2975, pp. 362–363, 1936.

In connexion with a summary of some modern developments in wood preservation against fungal decay and fire, the writer mentions that interesting results have been obtained from the experimental use in northern countries, especially the U.S.S.R., of the naphthenates of copper or zinc in solution in organic solvents. Attention is drawn to the corrosive action on metal fittings of the hydrochloric acid formed by the decomposition of zinc chloride. Excellent protection is stated to be given by a mixture of potassium bichromate, sodium arsenate, sodium fluoride, and dinitrophenol, in which the fluoride constituent primarily confers the property of toxicity and the arsenate that of insolubility [cf. *R.A.M.*, xv, p. 333]. By the new osmotic process of impregnation [ibid., xv, p. 546] it has been found possible to penetrate pine-wood to a depth of 50 to 70 mm., so that the heartwood is reached, instead of only to 5 or 10 mm. as by ordinary methods.

Buckman (S. J.). **Creosote distribution in treated wood.**—*Industr. Engng Chem.*, xxviii, 4, pp. 474–480, 2 graphs, 1936.

The distribution of creosote in the sapwood of 21 freshly treated southern yellow pine [*Pinus palustris*] poles was studied at the American Creosoting Company Research Laboratory, Louisville, Kentucky, and determinations made of the amounts of wood substance, water, creosote, and air space present in the spring and summer wood portions of 159 annual rings from 11 poles.

Taking the creosote concentration in the outer ½ in. of sapwood as 100 per cent., the average distribution of the substance in 19 poles was such that the amounts in successive layers, ½ in. in thickness, were 80, 53, 35, and 22 per cent., respectively. In most of the annual rings investigated the creosote concentration was higher in the spring than in the summer wood, the latter offering relatively little accommodation. In certain cases, however, this disadvantage appeared to be offset by the greater facility of penetration of the summer wood, which occasionally resulted in large accumulations of creosote. The observed differences in the amount of air space in the treated spring and summer wood are discussed as a possible factor in 'bleeding' [*R.A.M.*, xv, p. 270].

Englund (B.). **Mögel i våt pappersmassa.** [Mildew in wet pulp.]—*Papp. Trävarutidskr. Finl.*, xvii, 24, pp. 1098, 1100, 1102, 1104, 1106–1108, 8 figs., 1935; xviii, 1, pp. 24, 26–30, 31–32, 9 figs., 1936. [English summary.]

Of recent years mildew and rot in wet pulp are stated to have become increasingly troublesome in the paper trade, and some general observations are made on the various defects due to these sources and on the possibilities of control, with special reference to the work of Kress and collaborators in the United States [*R.A.M.*, iv, p. 644], Håkon and Bade in Norway [ibid., xiv, p. 545], Melin and Nannfeldt in Sweden [ibid., xiv, p. 274], and Levón in Finland [ibid., xiv, p. 729].

Palén (A. G. P.). **Arsenikföreningar som träimpregneringsmedel.** [Arsenic compounds as wood preservatives.]—*Tekn. Tidskr.*, lxvi, 11 (*Kemi*, 3), pp. 17–23, 5 figs., 2 graphs, 1936.

A detailed account is given of experiments at a Swedish mining concern on the action of arsenites, especially zinc, and arsenates, including calcium, magnesium, barium, manganese, copper, and zinc, on wood-destroying fungi [cf. *R.A.M.*, xv, p. 414], the extent of infection by *Coniophora cerebella* [*C. puteana*], *Merulius lacrymans*, and *Lentinus squamosus* being measured by loss of weight in the impregnated blocks. Manganese and barium arsenates gave the best results when impregnated test blocks were exposed to the action of running water, while zinc and copper were also satisfactory. Marked resistance to leaching out is usually obtained when the wood is first treated with a solution containing a soluble alkali arsenate and then with one of a soluble salt of the metal to secure precipitation of the metal arsenate in the wood substance.

The arsenates used all gave very good results. The optimum concentration varied with the organisms but averaged 0·1 per cent. or less

of arsenic pentoxide to the dry wood substance. Calcium and zinc arsenates are the most advantageous from the financial standpoint, but the former should only be used in dry situations.

Uljanov (P. N.). **Drying and sterilizing wood and other structural materials with infra-red rays.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., iv, 8–9, pp. 327–332, 4 graphs, 1935. [Received April, 1936.]

In an investigation carried out by Mme E. Nazarova and the author and referred to in this paper, it was found that *Merulius lacrymans*, *Poria vaporaria*, and *Coniophora cerebella* [*C. puteana*] on wood blocks were completely destroyed in 24 hours by exposure to infra-red rays with a maximum energy at $\lambda = 2{\cdot}78\,\mu$ of a power of $9{\cdot}0–11{\cdot}0.10^7$ erg/(cm.^{2} sec.), the temperature at the surface of the blocks reaching 92° to 100° C., that of the reverse side being only 27° to 47°. In a comparative test of the sterilizing effect of heat maintained at 93° to 105° during the same period the results showed that heat proved lethal to the extent of 40 to 50 per cent. Infra-red rays of the same power and period of exposure, having their maximum energy at $\lambda = 1{\cdot}8\,\mu$ and $\lambda = 4{\cdot}3\,\mu$ gave lethal effects of only 75 per cent. and 30 per cent., respectively. It is evident from these data that in the sterilizing action of the infra-red rays on wood-rotting fungi the effect of the heat was merely to increase the electro-magnetic biological action of the rays themselves. [A fuller, but preliminary account of their work is published by Mme E. Nazarova in *Микробиол*, [*Microbiol.*], v, 1, pp. 59–65, 1 graph, 1936. (English summary.)]

Fedorintchik (N. S.). Агротехника в борьбе с почвенными организмами, паразитирующими на растениях. [Agricultural methods for the control of soil-inhabiting organisms, parasitic on plants.]—*Pl. Prot. Leningr., 1935*, 5, pp. 61–66, 1935. [English summary. Received May, 1936.]

Continuing his studies on cabbage club root (*Plasmodiophora brassicae*) [*R.A.M.*, xv, p. 475], the author states that the results of pot experiments in 1934 showed that soil taken from a field which had not been sown to crucifers for seven consecutive years still contained sufficient viable spores of *P. brassicae* to infect 26·6 per cent. of the aseptically grown cabbage seedlings that were planted in it, as against 81·2 per cent. infection in soil which carried diseased cabbages the previous year. Further tests showed that in a cabbage field rested for three years the viability of the *P. brassicae* spores was reduced to 43·7 per cent. and in one rested for five years to 40·0 per cent. In fields ploughed two or three times a year no diminution in the percentage germinability of the spores was found at depths varying from 5 to 30 cm., while in fields left unploughed for a year the soil taken at depths of 5 to 10, 15 to 20, 25 to 30, and 30 to 35 cm. gave 84·6, 77·0, 38·5, and 0·0 per cent. infection, respectively, of the cabbage seedlings planted in it. The investigations also showed that intensity of attack by the parasite is directly correlated with the number of viable spores in the soil, 300,000 spores and over per c.c. determining type 4, 10,000 spores type 2, and fewer spores type 1 infection [loc. cit.]. The findings are considered to indicate that crop rotation with cruciferous crops recurring every fourth year,

with grass or clovers during the last two years to avoid ploughing, should be sufficient to give commercial control of club root. Subsidiary tests showed that earthworms are actively concerned in the dissemination of *P. brassicae*, spores passing through the alimentary canal of the earthworm without injury.

Bubentzoff (S. T.). Мульчирование в борьбе с болезнями овощных культур. [Mulching in the control of diseases of truck crops.]—*Pl. Prot. Leningr., 1935*, 4, pp. 107–110, 1935. [English summary. Received May, 1936.]

Field experiments in 1934 in the Leningrad region showed that mulching the soil with paper (in strips as wide as the rows permit) reduced the loss in mature cauliflowers due to black leg (chiefly caused by *Moniliopsis aderholdi* [*R.A.M.*, xiv, p. 278; xv, p. 452] and more rarely by *Pythium de Baryanum*) from 37·2 to 14·4 per cent. in plots fertilized with stable manure, from 35·6 to 11·9 per cent. in plots that had received mineral fertilizers, and from 33·8 to 15·3 in non-fertilized plots. This reduction was probably due to the growth-stimulating effect of mulching on the plants, which allowed them to escape infection in the seedling stage, when they are most susceptible to the disease.

Lund (A.). **Undersøgelser over Kaalroeforraadnelsen i 1934, foraarsaget af Bakterieangreb.** [Investigations on Swede rot in 1934 caused by bacterial infection.]—*Tidsskr. Planteavl*, xli, 2, pp. 323–336, 4 figs., 1936. [English summary.]

Swede turnips in Denmark suffered heavy damage both in the field and in storage during 1934 from a bacterial root disease [cf. *R.A.M.*, xv, p. 73] developing as a sequel to infestation by *Brevicoryne brassicae* and *Contarinia nasturtii*. Infection began at the root collar and spread downwards, producing a greyish-brown rot. A characteristic dark zone usually marked the line of separation between the diseased and healthy tissues. A green-fluorescent bacterium isolated from the infected material induced the typical symptoms of the rot in inoculation tests on swedes in the field and on excised portions of root, from which the organism was easily reisolated. On the other hand, seedlings three weeks old in pots were not attacked.

From a consideration of the morphological and cultural characters of the swede bacterium it would seem to be identical with *Bacillus brassicaevorus*, reported on cauliflower from France [ibid., vi, p. 330]. The latter organism, however, has not been fully described, so that an exact determination of its relationship with the Danish organism cannot be made. The swede pathogen is believed to occur normally as a saprophyte in the soil, penetrating the roots of the host through wounds made by insects and behaving within the tissues as a facultative parasite.

The Wilhelmsburg variety appears to be a good deal more resistant to the bacterial rot than Bangholm. Losses in storage might be substantially reduced by careful selection before transferring the swedes from the field to the pits.

Hanley (F.) & Mann (J. C.). **The control of heart rot in Sugar-Beet.**—*J. Minist. Agric.*, xliii, 1, pp. 15–23, 3 figs., 1936.

During the wet years 1930 and 1931 heart rot of sugar beets [*R.A.M.*, xv, p. 551] was uncommon in the eastern counties of England, but the three successive dry seasons, from 1933 to 1935, favoured the development of the disease.

On 21st March, 1935, applications of 0, 4, 14, and 28 lb. borax were given to part of a field that had suffered severely a year before, each treatment being replicated four times on $\frac{1}{40}$ acre plots arranged in a Latin square. The beets were sown on 12th April and no serious trouble was experienced until late July. On 21st August the plots showed, respectively, 51·2, 42·5, 6·1, and 5·9 per cent. heart rot. With the onset of showery weather in September, the affected beets put out new shoots: one half of each plot was lifted on 30th September, leaving the remainder to be lifted on 18th November. At the first lifting the plots yielded, respectively, 5·3, 5·6, 6·5, and 6·7 tons of washed beet per acre with sugar percentages in the roots of 14·5, 15, 15·6, and 16, the corresponding figures for the second lifting being 6·2, 6·7, 7·7, and 8·2 tons and 14·3, 14·9, 16·1, and 16·4 per cent. sugar. The results suggest, however, that the 14 lb. per acre application was not quite sufficient, and applications are recommended at the rate of about 21 lb. per acre, which would cost approximately 2*s.* 9*d.* The general inclusion of borax in compound fertilizers is not advised, and it should be used mixed with sand or dry soil and only on fields known to produce diseased crops.

Fyfneal x (B. S.) & Glasscock (H. H.). **Soils in relation to marsh spot of Pea seed.**—*J. agric. Sci.*, xxvi, 1, pp. 59–84, 3 figs., 1 map, 1936.

A detailed survey of the soils of 165 fields in Kent in which peas were being grown on a commercial scale showed that the occurrence of marsh spot [*R.A.M.*, xiv, pp. 279, 280] was correlated with the presence of a high water-table, incidence being great only in fields with a water-table within 52 in. of the surface. In these conditions a maximum of 100 per cent. of the seeds was affected, whereas in their absence the maximum was only 3 per cent. With some exceptions light and heavy soil texture was correlated with the least and highest average incidence, respectively, the effect of texture upon water movement in the soil probably accounting for the difference. High percentages of marsh spot were observed in two very dry seasons. The evidence obtained clearly demonstrated that occurrence is entirely unconnected with a protracted growing period, contact of pods with the ground, the presence of common salt in the soil, deficiency of available potash and phosphates, and cropping system; potash applications were useless in a very dry season.

Pethybridge (G. H.). **Marsh spot in Pea seeds: is it a deficiency disease?**—*J. Minist. Agric.*, xliii, 1, pp. 55–58, 1936.

After pointing out that owing to important deviations it is not safe to conclude that water-table and soil texture factors themselves cause marsh spot of peas [see preceding abstract], though they may be contributing agents, the author states that no method of preventing the disease on certain soils has yet been discovered. In one locality in which the

trouble has become increasingly serious in recent years oats in close proximity to the peas were found to be affected by grey speck due to deficiency or non-availability of manganese [*R.A.M.*, xv, p. 356]. Two groups of the pea rows (Prestige, Gradus, and Quite Content varieties) opposite the oats, one near the top of the sloping field, the other about 100 yds. lower down, were selected, one half of each row being twice treated with 1½ oz. manganese sulphate dissolved in 20 galls. water, with an interval of one week in mid-June, the other half being left untreated. On 16th July no differences were apparent between the treated and untreated plants. Examination in due course of 100 seeds from each half-row (three being omitted) showed that in the group from the top of the hill the greatest and least reductions in the disease in the treated rows were 67 and 6 per cent., respectively, as compared with the controls, the corresponding figures for the group at the bottom of the hill being 43 and 15 per cent. In every case the percentage of affected seeds was less in the treated than in the untreated plots. It is provisionally concluded that manganese deficiency may have some connexion with the disease.

Pugsley (A. T.). **Halo blight of Beans—some relationships of the pathogen.**—*J. Aust. Inst. agric. Sci.*, ii, 1, pp. 30–31, 1936.

Evidence is adduced showing that the green fluorescent bacteria *Phytomonas* [*Bacterium*] *medicaginis phaseolicola*, *P.* [*Bact.*] *mori*, and an unnamed bacterium pathogenic to stock (*Matthiola*) [*R.A.M.*, xv, p. 191] possess a closely similar, if not identical, heat-labile antigen, whilst the first-named possesses also a heat-stable antigen not shared by the other two; correlated with the latter characteristic was sensitivity to bacteriophage. Inoculations showed that pathogenicity of these organisms is limited to their original hosts.

Bremer (H.). **Zur Epidemiologie und Bekämpfung des Spargelrostes.** [On the epidemiology and control of Asparagus rust.]—*Gartenbauwiss.*, x, 1, pp. 51–73, 4 figs., 1 graph, 1936.

During the four successive winters since 1931 the writer has microscopically examined a large number of collections of asparagus rust (*Puccinia asparagi*) [*R.A.M.*, xv, p. 192] teleutospores overwintering in the open in Germany, with the result that only about a quarter of the total were found to be still viable at the time of primary infection in May. As already shown by Gassner and Hassebrauk [ibid., xiii, p. 677], teleutospores buried in the soil are more likely to survive the winter than those lying on the surface. While living within the temperature range from 7° to 30° C. and relative atmospheric humidity between 27 and 100 per cent. the longevity of the teleutospores is protracted in cool, dry surroundings. No obvious damage was inflicted on these organs by three weeks' exposure to extreme cold (−3° to −20°) or by daily alternations of temperature from −6° to +11° for two to three weeks. No correlation could be detected; moreover, between the meteorological conditions prevailing before and during the period of primary infection and the establishment of asparagus rust epidemics. On the other hand, the spread of the disease appears to be favoured by a hot, dry summer.

Attention has already been drawn [loc. cit.] to the need for the limita-

tion of new plantings as one of the most important means of combating *P. asparagi*, and the writer also stresses this aspect of the control problem. In two years' varietal reaction experiments the American rust-resistant Martha and Mary Washington tended to contract the disease later and more mildly than the other German and foreign sorts tested.

JOËSSEL (P. H.). **Essais de traitements contre les maladies du Melon en 1934.** [Experiments with treatments against Melon diseases in 1934.]—*Ann. Epiphyt.*, N.S., i, pp. 81–101, 5 graphs, 1936.

In further spraying tests against powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, xiii, p. 419] and anthracnose (*Colletotrichum lagenarium*) [ibid., xiv, p. 426] carried out near Avignon, Canteloup Charentais melons after receiving a general-purpose application of 1 per cent. copper oxychloride on 29th June were treated with (1) alkaline Bordeaux mixture (1 kg. copper sulphate and 700 gm. caseinated lime per 100 l. water), (2) lime-sulphur, (3) the Bordeaux mixture plus the lime-sulphur, (4) copper oxychloride, (5) permanganate of potassium and lime, and (6) lime solution.

Bordeaux mixture gave good results against both powdery mildew and anthracnose, and melons of maximum commercial value were obtained during the whole period of output, the profit from the treatment amounting to Fr. 1,845 per hect. Almost equally good results were given by Bordeaux mixture and lime-sulphur together. The next best (though much inferior) result was given by lime-sulphur.

LABROUSSE (F.). **Les maladies verticilliennes du Champignon de couche. (Première note.)** [*Verticillium* diseases of the edible Mushroom. (First note.)]—*Rev. Path. vég.*, xxiii, 2, pp. 162–172, 2 pl., 1 fig., 1936.

After referring to earlier investigations on the disease of edible mushrooms [*Psalliota campestris*] caused by *Mycogone perniciosa* [*R.A.M.*, xiv, pp. 554, 739] the author states that in his experiments he invariably obtained direct infection of the sporophores of *P. campestris* by *M. perniciosa*, the resulting symptoms varying with the stage at which infection took place [cf. ibid., ix, p. 429]. No parasitic relationship was observed, however, between *M. perniciosa* and the actively growing mycelium of *P. campestris* [ibid., iv, p. 167], the almost immediate death of the latter at points in contact with germinating spores of *M. perniciosa* being due to a form of hyper-susceptibility, the parasite then existing purely saprophytically on the killed mycelium. The author also records the occurrence of the parasite on *Panaeolus campanulatus* and various species of *Coprinus* growing in mushroom-beds in France.

BOSC (M.). **Bouillies cupriques au sulfate d'ammoniaque.** [Cupric mixtures with ammonium sulphate.]—*Prog. agric. vitic.*, liii, 16, pp. 370–375, 1936.

Highly satisfactory results were again obtained by French vintners in 1935 by the use of ammonium sulphate with cupric sprays for the control of *Plasmopara* [*viticola*: *R.A.M.*, xiv, p. 814], and in general the replies to a *questionnaire* concerning various features of these mixtures, e.g., adhesiveness, wettability, absence of serious scorching of the

foliage, and delayed shedding of the leaves, were favourable. To a mixture consisting of 2 to 3 kg. copper sulphate, 1·5 to 2·5 kg. lime or 1·5 to 2 kg. carbonate of soda, and 100 l. water should be added 300 to 400 gm. ammonium sulphate, this amount being subsequently increased to 700 to 800 gm. (or 1 kg. in cases of actual invasion by the fungus).

Schneiders (E.). **Beobachtungen und Untersuchungen über die Reisigkrankheit der Reben (Rebenmüdigkeit).** [Observations and investigations on the 'reisig' disease of Vines (Vine exhaustion).] —*Gartenbauwiss.*, x, 1, pp. 110–150, 9 figs., 1936.

The formation of double nodes on vine shoots is considered to be a most important diagnostic feature of the 'reisig' disease [*R.A.M.*, xv, p. 479], occurring as it does before any other symptoms of the disturbance, such as loss of vigour and decline of fertility, and being obvious to the vintner at the time of pruning. The process has been observed to follow an absolutely systematic course and the tendency to double node production, like the occurrence of intracellular cordons (the typical internal indication of 'reisig'), is transmissible by cuttings, grafts, and seeds.

The following stages of the disease may be roughly differentiated. (1) A few years after the absorption of the infective principle [ibid., xiii, p. 492] from the soil, the plants display a deepening of the foliar indentations with marked asymmetry of the petiolar sinuses. (2) From the fifth to the tenth year after contracting infection the vines begin to form double nodes, with a short internode [court-noué] following the node without tendrils. (3) At this stage the racemes are irregularly placed and the berries loose, there is a tendency to pallor of the veins, leaf roll, and premature discoloration. (4) Under adverse conditions or with advancing age the vines show an extensive accumulation of intracellular cordons coinciding with an early arrest of development, shedding of the flowers, a yellowish-green mottling of the leaves, poor and delayed root regeneration, and retarded unfurling of the shoots and maturation of the wood. (5) Progressive deterioration ensues, combined with abundant sucker formation and (in Riesling and Elbling) 'parsley' leaves. (6) The final phase is marked by stunting, shortening of the nodes, and leaves with strikingly deep lobes and pointed teeth or asymmetrical and entirely deformed.

Up to and including the third of the above-mentioned stages the 'reisig' disease may be successfully combated by appropriate cultural measures designed to ameliorate the conditions favourable to the infective principle, including early and late frosts, defective aeration in the root-collar region, stagnant moisture, root rot, and the like. The 'reisig' pathogen remains entirely passive in the vines unless it is stimulated to activity by the weakening of the host through uncongenial surroundings. The disease is definitely a constitutional one and in no sense a mere expression of physiological degeneration. It is widely distributed in all vine-growing countries but assumes economic importance only where neglect or cultural anomalies predispose the plants to infection.

The concluding section of the paper deals at some length with various troubles liable to confusion with 'reisig', e.g., nutritional deficiencies, 'leaf fringe' or 'fan leaf' disease, and the complex of stem diseases

inaptly known as 'pith disease' associated with *Pumilus medullae* and other fungi [ibid., xv, p. 554]. The extremely rare 'leaf fringe' or 'fan leaf' has been erroneously identified with 'roncet'. The fringed leaves are mostly formed in the summer only on one or a few shoots. The internodes are of uniform length and the occurrence of intracellular cordons is not a consistent feature of the disturbance which, unlike 'reisig', does not appear to be transmissible by cuttings or grafts. Under the comprehensive term of 'roncet' must be understood the final stages of the 'reisig' disease as described above.

Goidanich (F.). **Osservazioni sul 'Pumilus medullae' V. e M.** [Observations on *Pumilus medullae* V. & M.]—*Riv. Pat. veg.*, xxvi, 3–4, pp. 85–87, 1936.

In this paper the author describes an infection of the branches of 5- to 6-year-old vines growing in Padua by *Pumilus medullae* [see preceding abstract]. At the point of grafting the trunks showed a conspicuous swelling which was less marked higher up. The bark was scarred by deep cracks the edges of which bore numerous brown tubercles arranged linearly. Part of the medulla and wood was brown and contained dark brown, septate hyphae approximately 4 μ in diameter. The tubercles along the cracks contained cavities, full of ovoid, colourless stylospores averaging 12 by 4 μ, resembling the spermogonia described by Viala and Marsais [ibid., xiii, p. 680]; no sclerotia, pycnidia, or perithecia were observed.

In culture the fungus gave rise to a dark brown mycelium with two kinds of hyphae, one about 5 μ in diameter and the other narrower, both kinds occurring together. This is stated to be the first record of the disease in Italy.

Branas (J.) & Bernon (G.). **Seconde contribution à l'étude du court-noué de la Vigne.** [A second contribution to the study of court-noué of the Vine.]—*Ann. Éc. Agric. Montpellier*, N.S., xxiv, 1, pp. 15–56, 2 figs., 1936.

In an investigation of the relationship between the amount and distribution of tannic substances present in vine shoots and the manifestation of court-noué symptoms [*R.A.M.*, xiv, p. 616; xv, p. 554] the authors differentiate between nine different forms of disease that from time to time have been loosely referred to by various workers as court-noué, viz., that originally studied by Ravaz in 1899, and also investigated by Petri, Pantanelli, and Ranghiano; that due to frost; a special type associated with weakness of the host [ibid., ix, p. 578]; the form known as 'acariosis'; that associated with *Pumilus medullae* [see preceding abstract], to which 'Markkrankheit' is probably related; Californian little leaf [ibid., xiv, p. 768]; a form, showing the presence of endocellular cordons, found in the south-west of France; reisigkrankheit [see preceding page]; and anthracnose deformée [ibid., xiv, p. 77] found on the Pauline hybrid. Of these only the first provided the material for the experiments [the technique of which is described in detail].

The results obtained [which are tabulated] showed that under the conditions of the experiment the organs of vines affected with court-noué contained a greater amount of tannins than the corresponding

parts of healthy vines, the ratio varying from 1·60 to 2·03 for fruiting branches and buds of Aramon and reaching as much as 3·12 for Riparia Gloire de Montpellier.

VIALA (P.) & MARSAIS (P.). **Nouvelles observations relatives à la maladie de la moelle (court-noué parasitaire).** [New observations on the pith disease (parasitic court-noué).]—*Rev. Vitic.*, lxxxiv, 2176, pp. 170–171, 1936.

The writers briefly resume their arguments in favour of the parasitic nature of court-noué of the vine, which they attribute to the attacks of *Pumilus medullae* [see preceding and next abstracts], and claim that confirmatory evidence in support of their hypothesis has been received from Rumania, Austria, and the U.S.S.R. In Languedoc good results are stated to have been obtained by arsenical treatments in the form of painting or spraying after pruning; here and in Charente and Champagne the ravages of the disease are of an alarming character.

MARSAIS (P.). **Les causes de dépérissement des Vignes.** [The causes of dying-off of Vines.]—*Rev. Vitic.*, lxxxiv, 2180, pp. 237–242, 1936.

Among the reasons assigned for the gradual dying-off of the vines (involving losses of up to 15 per cent. in the yield of vineyards in Languedoc, Charente, Champagne, and Alsace) are infection by *Pumilus medullae* [see preceding abstracts], *Stereum necator* [*R.A.M.*, xii, p. 486], chlorosis [ibid., xiv, p. 214], defective unions between stock and scion in grafting, and the establishment of vineyards on sites previously occupied by vines. Control measures based on soil sanitation, rational cultural practices, and fungicidal treatments are briefly outlined.

SCHANDERL (H.). **Untersuchungen über die systematische Stellung und die Physiologie des Kellerschimmels Rhacodium cellare Persoon.** [Investigations on the systematic position and the physiology of the cellar mould *Rhacodium cellare* Persoon.]—*Zbl. Bakt.*, Abt. 2, xciv, 5–8, pp. 112–127, 8 figs., 1936.

The salient features in the writer's researches on the taxonomy and physiology of the cellar mould, *Rhacodium cellare*, resulting in its transference to *Cladosporium* as *C. cellare*, have already been noticed from another source [*R.A.M.*, xv, p. 479].

CONNERS (I. L.). **Fifteenth Annual Report of the Canadian Plant Disease Survey, 1935.**—ix+76 pp., 1936. [Mimeographed.]

In this report, which is on the same lines as those of previous years [cf. *R.A.M.*, xiv, p. 494], it is stated that in 1935 wheat stem rust (*Puccinia graminis*) appeared in epidemic proportions in Manitoba and Saskatchewan, and in western Canada the epidemic was the worst ever recorded. The disease appeared in southern Manitoba about 1st July, and spread was so exceedingly rapid that by 25th July infections on common wheat ranged from 75 to 100 per cent. throughout all Manitoba south of the Riding mountains. In this area about 50 per cent. of the wheat was not harvested, and in parts of the south-west of the province under 5 per cent. of the bread wheat was threshed. The average yield of the common wheats in Manitoba amounted to only

about 4 bush. per acre and the total loss caused by the disease was estimated at $85,000,000. The rust-resistant variety Renown produced at the Dominion Rust Research Laboratory, Winnipeg, remained practically unaffected, while Thatcher, developed at St. Paul, Minnesota, was only very lightly rusted, and the use of these varieties, now about to be distributed, should largely eliminate the losses from rust.

Among the many other records of interest may be mentioned *Stagonospora meliloti* causing leaf spot or stem canker on lucerne, alsike clover [*Trifolium hybridum*], and sweet clover [*Melilotus*]; *Armillaria mellea* on mangolds in New Brunswick, apparently responsible for stunting of the plants; bacterial blight (*Phytomonas glycinea*) [*Bacterium glycineum*: ibid., xiii, p. 210] on soy-bean in Quebec, Ontario, and Saskatchewan; curly top of bean [*Phaseolus vulgaris*: ibid., xiv, p. 339] and soy-bean in British Columbia; bacterial rot of celery (*Pseudomonas* [*Bact.*] *fluorescens*) [ibid., xiv, p. 16] destroying an entire stock in storage in Ontario; *Gymnosporangium claviipes* [syn. *G. germinale*: ibid., xv, p. 159] on apple in Quebec and Nova Scotia; *Sclerotium tuliparum* on tulip [ibid., xiii, p. 493] in Ontario; and the following new records for Canada: *Uromyces betae* on sugar beets, garden beets, and mangolds, *Macrosporium carotae* on carrots [ibid., xiv, p. 560], *Peronospora manshurica* on soy-bean [ibid., xiii, p. 656], *P. meliloti* on sweet clover, a seedling-infecting loose smut of barley caused by a fungus closely resembling *Ustilago medians* [ibid., xiv, p. 353], and *Uromyces geranii* on geraniums.

Thompson (A.). **The Division of Mycology.**—*Rep. Dep. Agric. Malaya, 1935*, pp. 64–66, 1936.

In this report [cf. *R.A.M.*, xv, p. 78] it is stated that *Fomes lamaoensis* caused a saprophytic decay of old leaf bases of oil palms. *Ganoderma lucidum* was isolated from a root disease affecting about 50 coco-nut palms [ibid., xv, p. 436]. *Pythium complectens* [cf. ibid., viii, p. 674] was associated with *Sphaerostilbe repens*, and an unidentified *Pythium* with *Rosellinia* (? *bunodes*) [see below, p. 686] and *Ustulina zonata* in root diseases of tea seed-bearers. A leaf disease of Arabian coffee previously unrecorded in Malaya was caused by *Rhizoctonia* [*Corticium*] *solani* [ibid., xii, p. 760]; the infection occurred during wet weather on bushes grown under shade. Unmanured tuba plants [*Derris elliptica*] growing in exhausted soil showed a die-back due to root disease caused by *R. bataticola* [*Macrophomina phaseoli*: ibid., xv, p. 577]. In wet weather *Choanephora cucurbitarum* [ibid., xv, p. 280] infected the lower leaves of cassava. Tomato fruits and plants were badly attacked by *Phytophthora infestans* [ibid., xv, pp. 79, 111]. Leaf diseases and blackening of the grain of rice were caused by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xiv, p. 653] and *Nigrospora sphaerica* [ibid., vi, p. 758].

A list of the diseases of cultivated plants in Ceylon.—*Bull. Dep. Agric. Ceylon* 88, 47 pp., 1936.

A list, arranged alphabetically under the scientific names of the hosts, is given of the fungal, bacterial, algal, physiological, and virus diseases known up to March, 1935, to affect cultivated plants in Ceylon,

with an appendix on those caused by nematodes. Glossaries of the English and Tamil names of the plants, with their botanical equivalents, are also furnished.

McDonald (J.). **A revised list of plant diseases in Kenya Colony.**—*E. Afr. agric. J.*, i, 6, pp. 463–468, 1936.

This revised list of the plant diseases present in Kenya Colony incorporates the many new records made since the original list was prepared in 1929 [*R.A.M.*, ix, p. 272], and is believed to be a complete survey up to February, 1936.

Department of Botany.—*Rep. Ind. agric. Exp. Sta. 1934–35*, pp. 23–27, 5 figs., [? 1936].

Selections made in Indiana from the cross Chinese wheat × rye were highly resistant to stem and leaf rust of wheat [*Puccinia graminis* and *P. triticina*], leaf rust of rye [*P. secalina*], and wheat powdery mildew [*Erysiphe graminis*]. Hybrids from crosses of high quality wheat resistant to leaf rust with the Hussar and Hungarian varieties were highly resistant to 11 strains of bunt [*Tilletia foetens*] from various localities [*R.A.M.*, xv, p. 344].

Of the physiologic forms of *P. triticina* [ibid., xv, p. 492] occurring in the eastern soft red winter wheat areas in 1934 form 15 was predominant, followed by 9 and 55 (21 collections each), 44 (12), and 2, 5, 31, 56, 61, and 62 (infrequent).

During the year *Phytophthora cactorum* [ibid., xv, pp. 555, 597] was repeatedly isolated from fallen apples lying on the ground, indicating that the fungus is widely distributed in Indiana soils.

Considerable losses were caused by the collar rot phase of tomato early blight [*Alternaria solani*: ibid., xv, p. 406]. Surveys made in the spring of 1935 showed that the disease was epidemic on seedlings in south Indiana and present in most lots of seedlings imported from the southern states. Experimental evidence showed that frequent and thorough spraying with Bordeaux mixture controlled the disease in the presence of abundant inoculum in the soil.

Müller (A. S.). **Brazil: some new records of plant diseases in the State of Minas Geraes.**—*Int. Bull. Pl. Prot.*, x, 5, pp. 98–99, 1936.

A list is given of 27 new phytopathological records from Minas Geraes, Brazil [cf. *R.A.M.*, xiv, pp. 87, 634, 734; xv, pp. 3, 60] including *Cercospora aleuritidis* on *Aleurites fordii*, *C. stevensii* on soybean, *C. zeae-maydis* on maize [ibid., v, p. 252], *Puccinia allii* on onion [ibid., xiv, p. 735], *Bacterium mori* [ibid., xv, p. 191] and *C. moricola* [ibid., xi, p. 475] on mulberry, *Stachylidium theobromae* on Cavendish bananas [ibid., xiv, p. 427], *Corticium salmonicolor* on apple [ibid., xiv, p. 146], and *Phytophthora parasitica* on eggplant [ibid., xiv, pp. 194, 506].

Breed (R. S.) & Conn (H. J.). **The status of the generic term Bacterium Ehrenberg 1828.**—*J. Bact.*, xxxi, 5, pp. 517–518, 1936.

The status of the generic term *Bacterium* is considered to call for rectification by international action in the manner already applied to

that of *Bacillus* [*R.A.M.*, xv, p. 80]. The type species *Bact. triloculare* Ehrenberg 1828 being unrecognizable, later authors have felt free to redefine the genus. However, since none of the new definitions has gained universal approval, it is necessary to state how the term is being used in any given case to avoid confusion. On this account many authors have discarded the term, while others, including the writers, as suggested in an earlier paper [*J. Bact.*, iii, p. 445, 1918], prefer to retain it temporarily to describe such species of non-spore-forming rods as cannot readily be assigned to more clearly defined genera.

RIKER (A. J.). **Biochemical and physical-chemical studies on the bacteria which stimulate atypical and pathological multiplication of plant cells.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 107–111, 1936. [French summary.]

The author briefly summarizes recent investigations on the physiology of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) with special reference to the atypical, pathological cell multiplication involved in its growth [*R.A.M.*, xiv, p. 686; xv, p. 205]. He found that pathogenic and non-pathogenic sister single-cell cultures grown above and below the critical temperature range for pathogenicity on tomato showed no significant differences as regards multiplication in the host or such cultural characters as reduction of nitrates, fermentation of sugars and related substances, carbon dioxide production, cataphoretic velocity, and osmotic pressure and oxidation-reduction potential induced. The gall tissue showed more ash, alkalinity, total nitrogen, oxidizing enzymes, and respiratory activity but less cellulose, starch, pentosans, and reducing sugar than the contiguous healthy tissues. The viscosity of giant colonies grown upon agar media seems at present to be the only bacterial character that is correlated with pathogenicity.

WEST (J.). **Black pod of Cacao. Experimental control on native farms.**—*Eleventh Bull. agric. Dep. Nigeria*, pp. 55–65, 1936.

This paper, describing spraying and dusting experiments carried out in Nigeria from 1931 to 1934 against cacao black pod (*Phytophthora faberi*) [*P. palmivora*], is an expanded account of one already noticed from another source [*R.A.M.*, xiv, p. 217].

HUMPHREY (H. B.). **The development of disease-resistant plants.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 267–274, 1936. [French summary.]

After pointing out that in the development of disease-resistant plant varieties many qualities besides resistance must be studied in order to obtain a commercially desirable variety, the author discusses the methods used in this work in the United States, with particular reference to the breeding of wheat varieties showing combined resistance to rusts (*Puccinia* spp.) [*R.A.M.*, xiv, p. 567], bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*: ibid., xv, p. 563], loose smut (*Ustilago tritici*), and *Helminthosporium* foot rot [*H. sativum*], oats resistant to rusts [*Puccinia*] and smuts (*U. avenae* and *U. levis* [*U. kolleri*]) [ibid., xv, p. 434], flax varieties resistant to rust (*Melampsora lini* var. *lini-*

perda) [ibid., x, p. 108], and maize varieties resistant to Stewart's disease (*Aplanobacter stewarti*) [ibid., xv, p. 434] and smut (*Ustilago zeae*).

STAKMAN (E. C.) & HART (HELEN). **The nature of resistance of cereals to rust.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 253–266, 1936. [French summary.]

In this discussion of the general principles of the resistance of cereals to rust the authors present evidence for their view that there are at least three well-defined types of resistance of wheats to *Puccinia graminis tritici* and several less well-defined ones, the three former being (*a*) protoplasmic, (*b*) morphological, and (*c*) functional. A wheat variety may possess one type of resistance, or all or any combination of them. All are subject to considerable variation, the degree of variation and the frequency of its occurrence under a reasonably normal range of conditions determining when and to what extent a variety will be resistant.

WATERHOUSE (W. L.). **Presidential address. Some observations on cereal rust problems in Australia.**—*Proc. Linn. Soc. N.S.W.*, lxi, 1–2, pp. v–xxxviii, 1936.

Following a brief introductory sketch of the history of phytopathology, the author illustrates the importance of plant diseases by citing some striking examples of losses from cereal rusts (*Puccinia* spp.) in Australia and other countries, discusses the three factors involved in the causation of the rusts (pathogen, host, and environment), the origin of the fungi concerned in Australia and their seasonal perpetuation, physiologic specialization in *P. graminis tritici* [*R.A.M.*, xiv, p. 618], *P. g. avenae* [ibid., ix, p. 703], *P. triticina* on wheat [ibid., xi, p. 629], *P. coronata avenae* [*P. lolii*] on oats [ibid., xiv, p. 435; xv, p. 571], *P. anomala* on barley [ibid., vii, p. 314], and *P. dispersa* [*P. secalina*] on rye, and control by appropriate sanitary and cultural measures, dusting with sulphur, and breeding for resistance.

HEMMI (T.). **On the distribution of cereal rusts in Japan and the relation of humidity to germination of urediniospores of some species of Puccinia.**—*Proc. fifth Pacif. Sci. Congr., 1933*, iv, pp. 3187–3194, 1935.

Puccinia graminis on wheat, barley, oats, and other grasses, *P. glumarum* on wheat and barley, *P. simplex* [*P. anomala*] on barley, and *P. triticina* on wheat are stated to be distributed throughout the main islands of Japan from Hokkaido to Formosa, whereas *P. dispersa* [*P. secalina*] on rye occurs only in Hokkaido and Honshu. *P. lolii* on oats and *Uromyces setariae-italicae* (Diet.) Yoshino on *Setaria italica* are also widely distributed over the main islands, though the former has not been found in Shikoku or the latter in Hokkaido. *P. purpurea* on *Andropogon sorghum* var. *obovatus* and *Sorghum halepense* [*R.A.M.*, xiv, p. 258] is known only in Kyushu and Formosa. Aecidia of *P. graminis* have been collected on *Berberis vulgaris* but the rust is destructive on wheat and barley even in districts where the alternate host is absent. The very common *Thalictrum minus* var. *elatum* probably

serves to spread *P. triticina* among the wheat crops, at any rate in the north of the country. The work described in the remainder of the paper has already been noticed from another source [ibid., xiii, p. 83].

Barmenkoff (A. S.). Прибор для изучения реакции растения на паразита. [An apparatus for the study of the reaction of plants to parasitic organisms.]—*Pl. Prot. Leningr.*, *1935*, 7, pp. 148–149, 1 fig., 1935. [Received May, 1936.]

The apparatus described in this paper is stated to have been successfully used in 1935 in Russian phytopathological laboratories in studies on the physiological races of brown wheat rust (*Puccinia triticina*), and it is believed that it may also be useful in investigations on the inheritance of rust resistance in cereals. It consists of a closed glass tube, 16 cm. long and 2 cm. in diameter, internally divided by glass partitions into six chambers, each partition being perforated by a central hole, 0·6 cm. in diameter. Each compartment is further provided with a bordered lateral aperture, 1·2 cm. wide. One leaf on a growing cereal plant, after gentle rubbing between the fingers to remove its waxy covering, is threaded through all the holes of the partitions and the tube fixed in position by means of a wooden prop stuck into the ground; the partition holes are then carefully plugged with cotton-wool, so as to isolate the compartments from one another, after which the enclosed leaf sections are each inoculated with the rust form to be tested, and the lateral openings in the tube are also plugged with cotton-wool or a rubber stopper. The apparatus is left thus for a period of time sufficient for the establishment of infection, after which the lateral openings are unplugged and covered with cheesecloth to admit external air to the leaf sections. The apparatus should not be removed before the end of the experiments.

Vanderwalle (R.) & Larose (E.). **La désinfection à l'eau chaude des semences de Froment contre le charbon nu Ustilago nuda tritici Schaf.** [The disinfection of Wheat seed-grain by hot water against loose smut, *Ustilago nuda tritici* Schaf.]—*Bull. Inst. agron. Gembloux*, v, 1, pp. 74–88, 1 fig., 1936. [Flemish, German, and English summaries.]

The following results were obtained in the authors' experiments in the control of loose smut of wheat (*Ustilago tritici*) [*R.A.M.*, xv, pp. 431, 563] by pre-soaking, succeeded by the hot-water treatment proper [cf. ibid., xv, p. 353]. For pre-soaking a period of at least two hours at a minimum temperature of 25° C. was found to be necessary. The maximum benefit was derived from (1) 3½ hours' pre-soaking at 30° followed by 50 minutes at 50°; (2) 3 hours at 25°, 15 minutes at 50°; (3) 2½ hours at 25°, 15 minutes at 52°; and (4) 5 hours at 30°, 15 minutes at 48°. The germinative capacity of the seed-grain was, however, considerably impaired by treatments (2) and (3), and altogether the method is so complicated as virtually to confine its use to research stations and the like. In practice, therefore, the development of new resistant wheat strains is the first step towards a solution of the loose smut problem.

Sidorin (M. I.), Alexandrovskaya (Mme Z. V.), Uspenskaya (Mme M. S.), & Shirokova (Mme Z. N.). Влияние подзимних посевов яровой Пшеницы на зараженность пыльной головней. [Effect of late autumn sowing of spring Wheat on the degree of infection with loose smut.]—*Pl. Prot. Leningr.*, *1935*, 7, pp. 130–135, 1935. [English summary. Received May, 1936.]

The results of experiments from 1932 to 1934, inclusive, in the region of Moscow showed that when seed-grain of Lutescens 062 spring wheat, naturally infected with loose smut (*Ustilago tritici*), was sown in experimental plots in late autumn (end of November and beginning of December), the resulting crops were entirely free from the smut, while the crops raised from the same seed-grain sown in the following spring showed from 2·1 to 3·2 per cent. infection with the smut. The autumn-sown plants developed more vigorously than spring-sown and gave a slightly better yield.

Вюснheim (A. N.). О влиянии промораживания семян Пшеницы, зараженных пыльной головней, на всхожесть и развитие растений. [Effect of freezing on the germinability of Wheat seeds infected with loose smut, and on the development of the plants raised from them.]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 134–137, 1935. [Received July, 1936.]

An account is given of experiments in Moscow, in which seed-grain collected from wheat plants artificially inoculated with loose smut [*Ustilago tritici*] the preceding year was soaked for 24 hours in water and then frozen for 6 hours at —6·8° C. before being sown in the spring of 1935. The results showed that the smut-infected grains were not more susceptible than the normal to the action of frost which did not kill the mycelium inside the grains. A slight reduction (57·2 as against 61·8 per cent.) was noticed in the percentage of smutted ears, due to the fact that the plants raised from the treated seed on the average contained 4·5 tillers as against 3·35 in the infected controls.

Becker (T.). **Untersuchungen über Sexualität bei Tilletia tritici (Bjerk.) Wint. im Rahmen der Immunitätszuchtung.** [Studies on sexuality in *Tilletia tritici* (Bjerk.) Wint. in relation to breeding for immunity.]—*Phytopath. Z.*, ix, 2, pp. 187–228, 4 pl., 3 figs., 1 diag., 1936.

Sporidial material of *Tilletia tritici* [*T. caries*] for inoculation experiments was best secured by germinating the spores under artificial illumination, beginning at a temperature of 20° C. and then alternating between 10° and 15°. A full description is given of the improved technique of isolation and culture which facilitated the production of numerous sporidia (up to 12 or 13) from each spore. A strongly heterozygous character was apparent in the growth habit (types of which are illustrated by a number of photographs) of all but one or two of the 275 monosporidial lines examined on a potato sucrose agar medium. Only one spore showed homozygous growth. The rapid provision of a large quantity of inoculum was effected by reducing the proportion of agar from 2 to 1·4 per cent. so that the surface of the

substratum in the Erlenmeyer flasks was partially covered with a layer of moisture. Flor's method of inoculation by introducing the mycelium into the coleoptile [*R.A.M.*, xi, p. 440] gave the most reliable results.

Growth characters did not serve as a means of differentiating the strains. An analysis of the sexual relations in *T. caries* revealed the occurrence of bipolarity within monospore progenies, while a more complex situation was indicated in the case of combinations of haploid lines of various spores of diverse origin. The inheritance of 'aggressiveness' [ibid., ix, p. 120] in tests on the Panzer wheat variety appeared to follow an intermediate and a recessive course, respectively, in two different combinations between the Breslau and Lyngby (Denmark) collections of the fungus. The inheritance of certain growth habits was studied through three monospore generations of *T. caries*, but though the fact of transmission is unquestioned no light was thrown on the manner of its occurrence.

T. levis [*T. foetens*] occurs only occasionally in Germany and single spore isolations showed no difference in growth type from those of *T. caries*.

Denaiffe, Colle, & Flandrin. **Traitements anticryptogamiques et germination.** [Fungicidal treatments and germination.]—*J. Agric. prat., Paris*, N.S., c, 19, pp. 381–382; 20, pp. 401–403, 4 graphs, 1936.

In a test carried out at an experimental farm attached to a French seed-grain-producing establishment, where between 14,000 and 15,000 germination tests are made each year, wheat samples treated by the ordinary copper sulphate and lime method and subsequently preserved in packets germinated as satisfactorily in the following year as at the time of application. The preparation in most frequent use at the experimental farm is a mixture of copper sulphate and copper acetate, which can safely be employed at a strength of up to 2 per cent. (12 minutes' immersion) or 5 per cent. of the weight of the seed-grain (dusting) without impairing germination. In practice it is probably wiser, however, to use this combination at a concentration of 1 to 1·5 per cent., immersing the seed-grain for 10 minutes and draining immediately afterwards. This treatment is effective against wheat bunt [*Tilletia caries* and *T. foetens*: *R.A.M.*, xi, p. 100].

Nieves (R.). **Genética de la resistencia a la 'carie' ('Tilletia tritici' raza 5 M.A.), en la cruza Barletta×Florence (Cheg 27–10x).** [Genetics of resistance to bunt (*Tilletia tritici* strain 5 M.A.) in the cross Barletta×Florence (Cheg 27–10x).]—*Physis, B. Aires*, xii, 41, pp. 51–63, 1936.

A tabulated account is given of the writer's studies on the hereditary nature of the character for resistance to bunt (*Tilletia tritici*) [*T. caries*] strain 5 M.A. in the wheat cross Barletta×Florence [*R.A.M.*, xiv, p. 626]. Susceptibility was shown to be dominant, the following principal factors being involved: $S_1S_1S_2S_2$, representing the genotypical constitution of Barletta, that of Florence being expressed by $s_1s_1s_2s_2$. Segregation occurred in the F_2 in the ratio of 9 : 3 : 3 : 1, comprising

9 hypersusceptible lines with 40 to 100 per cent. infection, 3 susceptible (25 to 40), 3 moderately susceptible (10 to 15), and 1 resistant (0 to 10). The abnormally variable response of the plants to infection is attributed partly to the existence within the host of numerous distinct races, and in part to physiologic specialization in the parasite.

Nieves (R.). **Distribución y prevalencia relativa de la 'Tilletia tritici' y 'Tilletia levis' (caries del Trigo) en la región de Guatraché.** [The distribution and relative prevalence of *Tilletia tritici* and *Tilletia levis* (Wheat bunt) in the Guatraché district.]—*Physis, B. Aires*, xii, 41, pp. 64–70, 1936.

The data here presented on the distribution, relative prevalence, and economic importance of *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*] in the wheat-growing centres of La Pampa, Argentine Republic, have already been noticed from another source [*R.A.M.*, xiii, p. 751].

Henry (A. W.). **The summerfallow in relation to foot-rot diseases of Wheat in Western Canada.**—*Proc. fifth Pacif. Sci. Congr. 1933*, iv, pp. 3205–3209, 1935. [Received June, 1936.]

Observations in Alberta over a period of five years showed that wheat following summer fallow is generally freer from foot rot than that grown after wheat, especially in the drier areas, where take-all (*Ophiobolus graminis*) [*R.A.M.*, xii, p. 622; xv, p. 490] is relatively rare. Brown root rot (*Pythium* spp.) [ibid., xv, p. 432], on the other hand, is distinctly favoured by conditions of the summer fallow.

In experimental plots at the University of Alberta records made in 1932, when foot rot was apparently chiefly due to *Helminthosporium sativum* [loc. cit.], showed that plots sown with wheat continuously gave the lowest yield and highest infection, while the results from wheat following two years of summer fallow were vice versa; the yield differences were, however, probably due in part to seasonal climatic conditions. Take-all was very noticeable in certain plots in 1931 following summer fallow the previous year, the severity of the disease in plots of wheat after wheat being no greater, even if as great. Foot rots of wheat caused by *H. sativum* and possibly certain other fungi may, therefore, be more effectively suppressed by summer fallowing than that caused by *O. graminis*, a conclusion which is stated to be apparently borne out by greenhouse experiments.

Marland (A. G.). Влияние почвенных факторов на проявление фузариоза всходов Пшеницы. [The effect of soil factors on the infection of Wheat seedlings by *Fusarium* spp.]—*Pl. Prot. Leningr., 1935*, 6, pp. 99–106, 1935. [Received July, 1936.]

Mycological analysis of wheat field soils (from 1932 to 1934, inclusive) taken from the Leningrad and the Azoff–Black Sea regions showed that while the latter soils contained a greater variety of species of *Fusarium*, the former were richer in species belonging to the section *Discolor*, including species particularly pathogenic to wheat. Most of the *Fusarium* spores were found at depths down to 20 cm., below which

their numbers sharply declined. The pathogenic forms were most abundant at the time when autumn-sown wheats emerged from the soil. In controlled experiments with *F. culmorum* [*R.A.M.* xv, p. 496] and *F. graminearum* [*Gibberella saubinetii*], which are stated to be the most injurious to wheat crops in north Russia, the optimum temperature for the germination of the spores of the two species was found to be between 21° and 27°C., while temperatures above 32° sharply reduced their viability, at 12° the spores germinated within four hours. Exposure of the spores to temperatures between 4° and 7° for one month did not affect their high virulence to wheat seedlings while temperatures of 30° and above strongly reduced their pathogenicity. Both species required the presence of liquid water for germination, but in artificial inoculation experiments it was shown that maximum infection of wheat seedlings (Lutescens 0111) occurred at relative humidities of 9 to 70 per cent., a reduction occurring at 94 per cent. Wounding of the wheat seedling root system appeared to facilitate infection.

Kholodkov (I. E.). К вопросу о протравливании пораженных семян пшеницы. [On the problem of the disinfection of Wheat seed-grain infected by *Fusarium*.]—*Pl. Prot. Leningr.*, 1935, 7, pp. 119–124, 2 figs., 1936. [English summary. Received May, 1936.]

The results of comparative experiments in 1934 at Kursk and Rostóv-na-Don showed that hot-water treatment (3 hours at 20° C. and 7 mins. at 52° to 53°) of wheat seed-grain (Lutescens 0111), naturally heavily infected with *Fusarium avenaceum* [see below p. 541] and other species of the genus, entirely prevented the infection of the seedlings with the fungi, but somewhat reduced the viability of the seed. The best commercial control was given by steeping the seed for 30 minutes in 0·25 formalin [imported] which reduced seedling infection from 11·6 per cent. in the controls to 2·4 per cent. and increased the yield from 4·04 and 4·55 to 5·4 mc. per ha. [1·41 and 1·49 to 2·18 cwt. per ac.]. Steeping in an ammoniacal solution of 0·1 per cent. ammoniacal amine ($C_6H_{12}N_4$) for 30 minutes completely suppressed seedling infection but only increased the yield to 4·99 mc. [1·99]. Some germinal [*R.A.M.*, xv, p. 109] was almost as good, immersing the seed-grain in water deprived of its oxygen [cf. ibid., xv, p. 51], or keeping it in oxygen-free atmospheres for various lengths of time gave no control of the fungi and seriously injured the germinability.

Noll (A.). **Experimentelle Untersuchungen über den Befall des Weizens mit *Penicillium*.** [Experimental studies on *Penicillium* infection of Wheat.]—*Phytopath. Z.*, ix, 2, pp. 147–196, 6 figs., 1936.

The first symptom of *Penicillium* infection on wheat [*R.A.M.* xiv, p. 266] appears on the seed-grain. In inoculation tests with one of the six green strains isolated from diseased wheat plants at about 20° C. under normal moisture conditions, pale areas, later darkening to

greyish-green fungal masses of felt-like consistency developed three to four days after sowing, chiefly at the periphery of the embryonal integument, and overgrew the basal portions of the seedling. A gradual weakening of the plants followed, manifested in a few cases by early arrest of growth, but in the majority merely by general sickliness and chlorosis.

The unidentified strain of *Pseudham* used in these experiments is characterized by hyphæ of very variable diameter averaging 4·6 to 7·4 μ in width. The conidia smooth, usually measure 4·8 μ in diameter minimum, 5·1 μ, the cylindrical, usually tapering sporangia 4·5 by 5·6 μ, and the conidia 13·1 by 4·6 μ. The cultural and physiological characters of the fungus are fully described. A special technique (which is explained in detail) was devised for the inoculation of the seed-grain with a spore suspension of the *Pseudham*. Washing was found to be essential to infection, which took place even through the mature leaves and culms sustained in the normal course of harvesting operations. The examination in 1924 of 50 seed samples of different varieties from a number of sources showed 4 per cent. *Pseudham* infection in germinating wheat and 18 per cent. in rye. The latter caused considerably more damage at low temperatures, the dry weight of diseased seedlings in relation to healthy ones at 4° C. being some 28 per cent. lower than at 20°. Insufficient moisture in the seed-bed was responsible for increasingly heavy losses—from 17 per cent. at 50 per cent. of saturation to 92 per cent. at 5.

The hyphæ of the fungus penetrated the seed between the pericarp and testa and permeated the aleurone layer, whence they migrated singly into the endosperm, covered the epithelium of the scutellum, and finally formed dense mats in the invaded cells. In other places the parenchyma of the scutellum and the tissues between the testa and the root were also attacked.

Of the eight standard treatments tested for the control of *Pseudham* infection in wheat, the germisan short immersion process and immersion in sulphur-mercurial were the only two with a limited degree of efficacy, reducing the incidence of disease from 100 to 36 and 32 per cent., respectively.

Larsen, R. W. J. **Further experiments on the control of Barley smuts.**—*Tech. Bull. U.S. Dep. Agric.* 113, 12 pp., 1929.

In further experiments on the control of covered smuts (*Ustilago hordei* and black loose smut (*U. nuda*) [*R.A.M.*, xv, p. 547] of barley both diseases were completely controlled on seed inoculated by the evacuation and dry spore methods [*ibid.*, xv, pp. 451, 547] by certain old and new improved organic dusts [*ibid.*, xv, p. 11 *et passim*], the former applied at the rate of 1 or 2 oz. and the latter at the rate of ½ oz. per bushel of seed. Soaking for 1 hour in a 1 in 500 formaldehyde solution eliminated *U. nuda* and gave fair control of *U. hordei*. Formaldehyde dusts were not consistently effective.

In two consecutive years barley from fields badly infected with *U. hordei* produced crops with very low percentages of smutted heads. Inoculation by the dry spore method gave the better results for *U. nuda* and the evacuation method for *U. hordei*.

Reed (G. M.). **Reports on research for 1935. Plant pathology.**—*Rep. Brooklyn bot. Gdn, 1935* (*Brooklyn bot. Gdn Rec.*, xxv, 2), pp. 45–59, 1936.

Extensive experiments carried out in New York in 1935 to ascertain the influence of the host plant on the development of oat loose and covered smuts (*Ustilago avenae* and *U. kolleri*) [*R.A.M.*, xv, p. 434] following penetration by the parasite showed that there were very decided differences in the rate of growth and development of the host plants dependent on length of daylight, presence of sodium nitrate in the soil, and presence or deficiency of nitrate, potash, and phosphate.

In further studies on the inheritance of resistance of oats to loose and covered smuts 180 F_3 progenies of Hybrid 82 (Danish Island× Monarch) were inoculated with *U. avenae*, the former parent being susceptible to *U. avenae* and resistant to *U. kolleri*, and the latter vice versa. Of the inoculated plants 78 were resistant, 79 segregating, and 23 susceptible. In another series 179 F_3 progenies of the cross were inoculated with *U. kolleri* and showed 1 plant resistant, 64 segregating, and 114 susceptible. Considerable data are also given regarding a number of other hybrids.

Studies by L. G. Utter on the characteristics of *U. avenae* and *U. kolleri* when grown on artificial media showed that neither smut can be separated from the other on a basis of its behaviour in culture; also the physiologic races of these fungi cannot be definitely distinguished by this means. In 1933 combinations of cultures involving 13 single conidial isolations of loose with 3 of covered smut [ibid., xv, p. 570] were used to inoculate Gothland and Monarch oats, the chlamydospores collected from the infected plants being used for further inoculations in 1934, and the process being repeated in 1935; the evidence obtained indicated that through the combination of the original cultures two new types of smut had arisen, a loose smut capable of infecting Monarch, and a covered smut capable of infecting Gothland.

In studies by Miss D. E. Marcy further evidence was obtained from F_2 hybrids that resistance to *Sphacelotheca sorghi* [ibid., xiv, pp. 438, 574] is dominant in Milo crosses and susceptibility in Feterita crosses. On the other hand, susceptibility to *S. cruenta* [loc. cit.] in the Milo hybrids is probably due to a dominant factor and in the Feterita hybrids to a recessive one. The reaction of the hybrids to the two smuts was thus exactly opposite. Of the data regarding the F_3 progenies, it may be mentioned that when progenies of a cross between Feterita and Dwarf Yellow Milo were inoculated with *S. cruenta* no infection resulted, indicating that both varieties contain the same factor or factors for resistance. Experimental evidence demonstrated that the number of infected plants of a susceptible variety inoculated with *S. sorghi* may vary from 0 to 94·1 per cent., dependent upon the environmental conditions prevailing during germination.

Murphy (H. C.), Stanton (T. R.), & Coffman (F. A.). **Hybrid selections of Oats resistant to smuts and rusts.**—*J. Amer. Soc. Agron.*, xxviii, 5, pp. 370–373, 1 fig., 1936.

Further promising results were obtained in respect of resistance to crown and stem [black] rust (*Puccinia coronata* [*P. lolii*] and *P.*

graminis) and loose and covered smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) in experiments in Iowa with crosses of Bond (C.I. 733)× Iogold (C.I. 2329), Anthony (C.I. 2143)× Bond, Bond× Iowa No. D69 (C.I. 2463), and Green Russian selection (C.I. 2344)× Bond oats, which have now reached the F_5 generation [*R.A.M.*, xiii, p. 434; xv, p. 571]. The epidemics to which these selections were subjected having been much more severe than those ordinarily occurring in the field, there is believed to be every hope of their continued resistance to both rusts and smuts under normal conditions.

Anliker (J.). **Beiträge zur Kenntnis der Fusariose des Roggens.** [Contributions to the knowledge of Rye fusariosis.]—*Beitr. Kryptogamenfl. Schweiz*, viii, 4, 115 pp., 3 pl., 3 figs., 1 diag., 19 graphs, 1935.

The following fungi, in order of frequency, were isolated from young rye plants in diseased stands in central Switzerland: *Calonectria graminicola*, *Fusarium herbarum* [*F. avenaceum*: *R.A.M.*, xiv, p. 709], *F. solani* var. *martii* [ibid., xiv, p. 613], *F. orthoceras* var. *longius*, *F. merismoides* [ibid., xiv, pp. 123, 653], and *Cylindrocarpon olidum* [ibid., xv, p. 605]; *F. equiseti* and *F. solani* were isolated from rye seed-grain, and *F. sambucinum* [cf. ibid., xiv, p. 409; xv, p. 6] (*Gibberella pulicaris*) from young, diseased wheat plants. The spore dimensions of one of the strains of *Calonectria graminicola* examined were intermediate between those of the type species and those of *C. graminicola* var. *neglecta* [ibid., xiv, p. 297] (*F. nivale* var. *majus*) (triseptate conidia 26 by 4·7 μ, 4- to 5-septate 31·6 by 4·9 μ, and 6- to 7-septate 33·6 by 5·15 μ).

An analysis of the replies to a questionnaire circulated among farmers in the districts covered by the survey revealed complete unanimity in respect of the correlation between virulence of the snow mould and the severity and duration of the snowfall [ibid., xi, p. 777; xii, p. 623]. Very moist soils are generally considered to promote infection, which is further favoured, according to some reports and confirmed by the author's field experiments, by an abundance of humus. The Petkus variety is commonly regarded as more, and Rothenbrunner as less, susceptible than the ordinary local rye. Yield reductions of 20 to 25 per cent. appear to be frequent, while the loss of entire stands is occasionally reported. In general, late sowing (3rd November) increased the losses from snow mould as compared with medium-early (10th October) and early (21st September) planting, but further tests are required to confirm this information. With a few exceptions, treatment of the seed-grain with mercuric chloride increased the yield.

In a culture of *C. graminicola* (Baarn strain) in a modified Richards's solution (without magnesium) the acidity increased from P_H 3·97 to 4·16 to P_H 3·0, whereas a virulent local strain from rye on malt extract of P_H 5·26 modified the reaction in the direction of neutrality.

In pot experiments the symptoms induced by inoculation with *F. avenaceum* were either equally severe throughout the temperature range of 6° to 34° C. or were most in evidence between 25·4° and 33°. In no case, contrary to expectation, was the highest incidence of infection observed at the intermediate and lower temperatures [cf. ibid.,

xiii, p. 719]. On Petkus rye *F. avenaceum* was more injurious in alkaline (P_H 8·80) than in neutral soils (P_H 6·98) [ibid., ix, p. 667]. A particularly vigorous, abundantly sporulating strain isolated from Petkus was much more highly pathogenic in these tests than that from Baarn. The maximum damage by *C. graminicola* (up to 100 per cent.) was inflicted at soil temperatures round about 26°; at 6° to 21° the injury was negligible [ibid., viii, p. 497; x, p. 94]. Under the conditions of these trials Petkus was considerably more resistant than local rye. As in the case of *F. avenaceum*, the effects of *C. graminicola* were most pronounced on alkaline soils.

Vilkaitis (V.). **I. Javų ligos. II. Cukrinių Runkelių ligos.** [I. Cereal diseases. II. Sugar beet diseases.]—Reprinted from *Rep. Pl. Prot. Sta. Dotnuva 1934*, 18 pp., 1936. [English summary.]

The results of experiments in 1934 showed that control of wheat bunt (*Tilletia tritici*) [*T. caries*] by seed dusting was unsatisfactory in soil heavily contaminated with the spores of the fungus. In plots artificially inoculated in the autumn, bunt spores were capable of infecting wheat seedlings for at least one month after inoculation, but seed sown 11 days from inoculation gave a much less bunted crop than that sown immediately, and a similar result was obtained in the spring. Of the six spring wheat varieties tested, Dotnuvos 81 and Heines Kolben showed only 1·27 and 1·41 per cent. bunted ears, respectively. On Lochows Petkus rye sown on the 5th, 11th, 16th, 21st, 26th of September, and 1st October, the degree of infection from brown rust (*Puccinia dispersa*) [*P. secalina*] declined from the first to the last date of sowing in the ratio 99 : 31 : 21 : 14 : 6 : 5. While none of nine rye varieties tested was highly resistant to stripe smut (*Urocystis occulta*), the Vierzbna variety only showed 7·61 per cent. infection; this fungus was shown to be capable of infecting rye seedlings at least four weeks after inoculation of the soil.

Field experiments confirmed the efficacy of applications of borax in the control of heart rot of sugar beet [*R.A.M.*, xv, p. 626].

Edwards (E. T.). **Root and basal stalk rot of Maize.**—*Agric. Gaz. N.S.W.*, xlvii, 5, pp. 259–261, 2 figs., 1936.

After describing the symptoms of root and basal stalk rot of maize, which in New South Wales is caused almost invariably by *Gibberella saubinetii* [*R.A.M.*, xi, p. 222; xv, p. 360] and each season causes serious economic losses (25 to 30 per cent. of the plants commonly being affected and sometimes up to 60 to 70 per cent.), the author states that control depends largely on field sanitation. The old stalks should be hoed out, raked up, and burnt as soon as possible; a definite system of rotation should be adopted when practicable, and, though only of secondary importance in control, seed selection should always be carried out as a precautionary measure.

Eide (C. J.). **The pathogenicity and genetics of Gibberella saubinetii (Mont.) Sacc.**—*Tech. Bull. Minn. agric. Exp. Sta.* 106, 67 pp., 7 pl., 5 figs., 4 graphs, 1935. [Received August, 1936.]

A total of 325 isolations was made from ascospores of *Gibberella*

saubinetii naturally occurring on maize stubble in wheat and barley fields in Minnesota [*R.A.M.*, xiv, p. 749], and compared with a culture originally obtained by Tu from Wisconsin [ibid., x, p. 721] and one from Iowa. All but 31 were of the same cultural type, varying only in degree of colour intensity. Of the 31, 24 resembled the majority on potato dextrose but differed on Coons's agar, which tends to emphasize variations in this fungus, while the remaining seven comprised three types, two represented by one culture each and the third by five from a single collection.

When first isolated from field material, only one of the single ascospore isolations produced perithecia in culture, but in the absence of visible variation (which seemed to involve a loss of the reproductive function) most of them manifested the capacity to do so when grown on oat hulls for a week and then stirred into sterilized sand in pots which were kept thoroughly wet in the greenhouse. In three cases the ability to produce perithecia in culture developed spontaneously in the same manner as other variations. Perithecial variants retain their cultural characters and capacity for perithecial formation when propagated from single ascospores, conidia, or germ-tubes from individual cells of either spore type, indicating that the cultures investigated are homothallic.

Details are given of a special method devised for the detection of minor differences in the pathogenicity of different cultures of the fungus to Rustler and Golden Bantam maize and Prelude, Pentad, and Marquillo wheat seedlings. The seedlings were scored according to the degree of infection represented by 10 and 4 standard types for maize and wheat, respectively, and the figures for 32 and 25 seedlings, respectively, in each replicate were totalled and analysed statistically. Apart from the variants, some of which were less virulent than the parent cultures, no striking differences were observed in the pathogenicity of the ascospore isolations from field material used in these tests.

STOREY (H. H.). **Virus diseases of East African plants. V. Streak disease of Maize.**—*E. Afr. agric. J.*, i, 6, pp. 471–475, 4 figs., 1936.

In this semi-popular account of maize streak, which is reported from many parts of Africa, including Egypt [*R.A.M.*, xv, p. 462], the author states that the secondary effects of the disease depend upon the age at which the plant becomes infected, seedling infection resulting in severe stunting and, usually, a failure to set any seed, whereas plants infected just before flowering show no apparent ill effects; infections at intermediate stages of growth cause malformation of the cobs and stunting of shoot and root growth.

Besides *Cicadulina mbila* and *C. zeae* [ibid., xiv, p. 146], a new vector has been found in East Africa in *C. nicholsi*, which somewhat resembles *C. mbila* but lacks the characteristic white stripe. The symptoms of streak disease are sometimes so similar to those of maize stripe that only insect transmission experiments can give a certain diagnosis.

For control it is recommended that the interval between crops should be extended to the maximum, volunteer plants should be destroyed, and that sowings in any given district should be made as nearly as possible at the same time.

RYAKHOVSKY (N. A.) & GAMARNIK (F. D.). **Испытание новых протравителей против головни Проса. [Tests of new dry seed disinfectants for the control of Millet smut.]**—*Pl. Prot. Leningr.*, *1935*, 6, pp. 137–140, 1935. [Received July, 1936.]

The results of two consecutive years' experiments at the Ramonskaya Seed-breeding Station showed that millet [*Panicum miliaceum*] smut (*Ustilago panici-miliacei*) [*R.A.M.*, xv, p. 569] was very satisfactorily controlled by the seed-disinfectant dust nivarsene, at the rate of 1·25 gm. to 1 kg. seed, prepared by the Soviet administrative unit NIUIF. The dust was only slightly less effective than formalin 1 in 300.

WANG (C. S.). **Sclerospora graminicola on Millet in Minnesota.**—*Phytopathology*, xxvi, 5, pp. 462–464, 2 figs., 1936.

Millet (*Setaria italica*) and foxtail grass (*S. viridis*) were severely parasitized in two localities of Minnesota in the summer of 1935 by *Sclerospora graminicola* [*R.A.M.*, xiv, p. 577], causing a yellowish-green, longitudinal streaking of the leaves of the dwarfed plants (primary symptoms) and the chlorotic local lesions typical of secondary infection [ibid., viii, p. 99]. When the old conidiophores of the fungus were removed from the leaf blades with a cotton pad a fresh crop grew through the stomata within four to six hours and conidia were formed two to four hours later, the entire process taking eight to twelve hours (only six to nine in a moist chamber). During four days' field observations conidia were produced in the daytime as well as by night [ibid., vii, p. 712] at a temperature range of 17° to 34° C. and relative humidity of 75 to 100 per cent. The conidiophores on *S. italica* measured 182 to 251 μ in length (average 228 μ) and the conidia 21·4 by 14·2 μ (43 by 26·4 in the case of 50 giant specimens). On *S. viridis* the conidiophores averaged 184·4 μ in length, ordinary conidia 19·2 by 14·7 μ, and giant ones 40 by 21·7 μ. The zoospores (usually four to each conidium) were typically biciliate.

HARVEY (E. M.) & RYGG (G. L.). **Physiological changes in the rind of California Oranges during growth and storage.**—*J. agric. Res.*, lii, 10, pp. 723–746, 5 graphs, 1936.

The results of storage experiments made in the course of this study with Washington Navel oranges from two localities of California indicate that late-picked fruit is most susceptible to brown stain (a rind blemish somewhat resembling common apple scald), and that the incidence of the trouble is increased by storage at 32° as compared with 42° and 52° F. With regard to pitting and spotting [see next abstract], the data are less clear-cut but seem to denote that susceptibility to these disorders depends on the environmental factors prevailing during the last few days before the picking of the fruit.

HARVEY (E. M.) & RYGG (G. L.). **Field and storage studies on changes in the composition of the rind of the Marsh Grapefruit.**—*J. agric. Res.*, lii, 10, pp. 747–787, 2 pl., 1 diag., 13 graphs, 1936.

The results of storage experiments with Californian Marsh grapefruit showed that fruit from all the three localities covered by the

tests pitted and spotted [see preceding abstract] most severely at 42° and least at 52° F., the damage at 32° being intermediate in extent. Mature fruit picked at Corona and Fontana early in the harvest sustained greater injury at 42° than that gathered later, while at 32° the relations were reversed and at 52° there was never more than a trace of storage blemishes. The Oasis fruit varied strikingly with the season in its reaction to pitting and spotting at 32° and 42°, the defects increasing as time advanced at the former temperature, while at the latter they reached a climax early in the season, dropped to a minimum at mid-season, and increased again towards the close. Neither trouble occurred at 52°. Fruit held for one period at 52° and then transferred to lower temperatures only spotted slightly, whereas that held at 42° or 32° continued to spot on transference to 52°. Weakly acidified atmospheres accelerated and enhanced pitting and spotting, which were retarded, on the other hand, by weak alcohol and ammonia.

When solutions of naringin and its phenolic derivative, naringenin, were injected into the albedo of grapefruit rinds, naringenin was approximately 1,000 times more toxic to the rind tissues than naringin. Rinds injected with 0·1 to 0·6 mg. of naringenin and held for five days at 42° frequently developed spots resembling those observed in storage. The fruit of individual trees seemed to show collectively a fairly consistent relative susceptibility or resistance to injury from given quantities of naringenin, and in some instances this susceptibility to naringenin injury was apparently correlated with the amount of storage spotting of the fruit.

BAUMGART (S.). **Xyloporosis, the new disease, its causes and prevention.** —*Hadar*, ix, pp. 71–74, 1936. [Abs. in *Hort. Abstr.*, vi, 2, p. 133, 1936.]

The writer explains his reasons for attributing xyloporosis of budded lime stocks in Palestine [*R.A.M.*, xv, p. 162] to the stoppage of descending sap at the point of insertion of the bud. The disorder commonly affects unskilfully grafted or otherwise injured trees, and may be largely prevented by using the T instead of the inverted T incision when budding, thereby preventing wounds below the budding eye which might impede the flow of assimilated nutrients. Other possible factors requiring investigation are the penetration of toxic substances into the tissue at budding, the pressure exerted by the edges of the cut bark on the swelling bud between them, and trunk wounds during stub removal.

THOMPSON (A.). **Ustulina zonata on the Oil Palm.**—*Malay agric. J.*, xxiv, 5, pp. 222–226, 1 fig., 1936.

In addition to outbreaks of charcoal base rot of oil palms (infected tissue of which yielded a mycelium resembling *Ustulina zonata* in culture) [*R.A.M.*, xiv, pp. 81, 357] in two localities in Malaya in 1933, another case was found in 1936 on a 7-year-old palm which showed a decay of ten leaf bases, the tissue of which was dry, tindery, dull tawny-olive, and permeated at the bottom with black lines surrounding light or dark islands; perithecia of *U. zonata* were present on four of

the leaf bases. Pure cultures isolated from the stem tissues have been made with a view to inoculation experiments. It is recommended that all diseased leaf bases and tissue should be burnt.

FAHMY (T.). **Immunity in plants and immunity to Fusarium wilt in Cotton.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 143–151, 1936. [French summary.]

In the first part of this paper the author distinguishes and discusses with numerous examples three factors influencing the reaction of plants to disease, viz., the genetic composition of the host, the strain of the parasite, and the conditions favouring infection. In the second part he concisely summarizes his work since 1923 on the genetics of resistance to cotton wilt (*Fusarium vasinfectum* var. *aegyptiacum*) [*R.A.M.*, xiii, pp. 631, 632].

FRAPS (G. S.) & FUDGE (J. F.). **Relation of the occurrence of Cotton root rot to the chemical composition of soils.**—*Bull. Tex. agric. exp. Sta.* 522, 21 pp., 2 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxv, 1, p. 65, 1936.]

In a study of the soil relations of *Phymatotrichum omnivorum* in Texas [*R.A.M.*, xv, p. 577], soils on which no damage was caused by cotton root rot contained on an average only about two-thirds as much total phosphoric acid, one-half as much nitrogen, total potash, and magnesia, one-third as much acid-soluble potash, one-fifth as much active phosphoric acid and active potash, one-seventh as much lime and basicity, and seven times as high a concentration of hydrogen-ions in the soil suspension as those where severe injury was sustained. The average composition of soils on which the effects of root rot were moderate or slight was generally intermediate between these two extremes.

LIKHITE (V. N.). **Stenosis in Gujarat Cotton.**—*Proc. Ass. econ. Biol., Coimbatore*, iii, pp. 15–17, 1 pl., 1936.

Cotton stenosis [*R.A.M.*, xv, p. 366] is stated to have been observed at Baroda experiment station since 1931; the condition usually affects the cut ratoon crop, though it may occur on a smaller scale in fresh and old crops and diseased plants are liable to die early. Various attempts to transmit the disorder by grafting were unsuccessful and it is doubtful whether it can be due to a virus. *Crotalaria juncea*, egg-plant, and sesame were also affected by a similar malformation.

LIKHITE (V. N.). **Host range of the Gujarat Cotton root rot.**—*Proc. Ass. econ. Biol., Coimbatore*, iii, pp. 18–20, 1 graph, 1936.

A field test carried out in Baroda showed the following hosts to be susceptible to *Macrophomina phaseoli*, the causal organism of the local form of cotton root rot [*R.A.M.*, xiv, p. 359; xv, p. 577]: sorghum, the smaller varieties of castor (*Ricinus communis*), *Hibiscus cannabinus*, *H. esculentus* [ibid., xiv, p. 83], *H. sabdariffa*, groundnut [ibid., xiv, p. 82], tobacco, sesame, soy-bean, papaw [ibid., xiv, p. 428], tomato, eggplant, and *Dolichos biflorus*, the fungus being isolated from the diseased

plants. The fungus was also present on a number of apparently healthy plants and on certain weeds.

Laycock (T.). **Cotton seed disinfection experiments to control bacterial diseases of the Cotton plant.**—*Eleventh Bull. agric. Dep. Nigeria*, pp. 22–30, 1936.

In a seed disinfection test carried out in Nigeria in 1929 against bacterial wilt of cotton (*Bacterium malvacearum*) [cf. *R.A.M.*, vii, p. 31] treatment with 1 per cent. germisan in a 0·2 per cent. soap solution gave, 24 days after planting, no diseased stands, as against an average of 21 per cent. in the untreated controls; on 22nd November (after heavy rain) the figures were 37 and 69 per cent., respectively. In 1931–2 treated plots finally averaged 7·4 per cent. infection, as against 76·3 per cent. in the controls.

Gauthier (M[arcelle]). **Sur un nouvel entophyte du groupe des Harpellacées Lég. et Dub., parasite des larves d'Éphémérides.** [On a new entophyte of the group of Harpellaceae Lég. & Dub., parasitic on the larvae of Ephemeridae.]—*C.R. Acad. Sci., Paris*, ccii, 12, pp. 1096–1098, 4 figs., 1936.

The larvae of *Centroptilum luteolum* Müll. in the streams and ponds of the Dauphiné, France, have been consistently found to be parasitized by a fungus of the Harpellaceae closely allied to *Genistella* [*R.A.M.*, xiv, p. 630] from which it differs sufficiently, however, in spore form to justify the establishment of a new genus and species, *Glotzia centroptili* [with a diagnosis in French].

In common with the majority of Harpellaceae the fungus is furnished with a main axis 1 to 2 mm. in height (firmly attached to the rectal cuticle of the insect by a callus-like lateral projection of the basal cell), and two or three large secondary branches arising from its base; the latter likewise produce lateral ramifications generally ending (as also the main axis) in conidiophores 100 to 120 μ long and consisting of 6 or 7 cells bearing spores laterally in a spiral arrangement. These spores are cylindrical rods, 40 by 4 μ, and after detachment are provided at the basal end with two short appendages, between which uncoils an extremely slender, spiral filament at least 7 or 8 times the length of the spore. In addition to these azygospores, biconical zygospores, 50 to 60 by 15 μ, are formed by the fusion of two hyphae and become detached at maturity, taking with them the short pedicel on which they are obliquely inserted.

Baldacci (E.). **La dénomination 'Actinomyces bovis' Harz. doit être supprimée comme 'nomen dubium'.** [The name '*Actinomyces* bovis' Harz. should be suppressed as a 'nomen dubium'.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 5, pp. 99–101, 1936.

Evidence is adduced that the name *Actinomyces bovis* [*R.A.M.*, xi, p. 242] has been applied to a number of different strains and must be rejected as a *nomen dubium*. The author recognizes *A. sulphureus* [ibid., x, p. 381] as a valid species and cites *Bacterium actinocladothrix*, *A.* sp. Protopopoff & Hammer (1890), *Oospora bovis*, and *A. bovis sulphureus* as synonyms.

Baldacci (E.). **Histoire, synonymie, et caractères culturaux de 'l 'Actinomyces sulphureus' Gasperini.** [The history, synonymy, and cultural characters of *Actinomyces sulphureus* Gasperini.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 5, pp. 102–105, 1936.

In this paper the author lists 11 synonyms of *Actinomyces sulphureus* [see preceding abstract] including, besides those previously mentioned, *A. bovis* Harz *fide* Waksman and also Lignières, and *A. hominis* [*R.A.M.*, v, p. 230]. In culture on glycerine nutrient agar (Waksman's formula) the fungus grows slowly, forming isolated, later confluent, circular or bubble-like, wax-coloured, blackish-brown, or brownish-yellow colonies, with a pulverulent, white, finally sulphur-yellow, very characteristic aerial growth, which makes its appearance on about the tenth day; there is slight blackening of the agar after about 50 days.

Dowding (Eleanor S.) & Orr (H.). **Transformation of Trichophyton gypseum into mosaic fungus.**—*Arch. Derm. Syph., Chicago*, xxxiii, 5, pp. 865–873, 14 figs., 1936.

Material from four patients having lesions containing the so-called 'mosaic fungus' [*R.A.M.*, xv, p. 582] without any organism developed no fungal growth on Sabouraud's medium. On the other hand, *Trichophyton gypseum* readily grew from scales containing both mosaic and normal hyphae. Observations of *T. gypseum* in potassium hydroxide preparations from the skin revealed a branched, septate mycelium, about 6 μ in width, comparatively straight at first, later becoming sinuous and reticulate and producing oidial spores by hyphal segmentation. When the walls of the dead fungal cells dissolve, a row of oil globules (simulating endospores) is left in the tissue; some of these bodies are converted into angular refracting segments constituting the mosaic fungus. Actual end-to-end contact has been observed between hyphae of *T. gypseum* and the 'mosaic fungus', the latter constituting a natural extension from the former. Moreover, during the healing process in a patient suffering from ringworm of the head, face, and hand, the living fungus decreased and the mosaic complex became more prominent.

Milian (G.). **Trichophytie de la main et éruptions secondaires à distance. Pathogénie.** [Trichophytosis of the hand and remote secondary eruptions. Pathogenesis.]—*Bull. Soc. franç. Derm. Syph., 1936*, 5, pp. 979–984, 1936.

Full clinical details are given of a case of trichophytosis of the right hand in a 55-year-old female patient, associated with remote secondary, atypical disturbances on the left forearm and both feet, the nature of which is discussed in relation to the theory of the transmission of infection either by toxins of the fungus (*Trichophyton asteroides*) [*T. mentagrophytes*: *R.A.M.*, xv, p. 92] or in response to allergic reactions. These hypotheses are not accepted by the writer, who believes the pathogen to have been circulated by the blood stream [cf. ibid., viii, p. 506 *et passim*]; this mode of infection would account for the difference in the appearance of the secondary lesions and those due to direct epidermal invasion.

Catanei (A.). **Les caractères de la résistance acquise dans les mycoses.** [The features of acquired resistance in the mycoses.]—*Bull. Soc. Path. exot.*, xxix, 5, pp. 451–457, 1936.

Following up his studies on the nature of acquired resistance to ringworm (*Ctenomyces* [*Trichophyton*] *mentagrophytes*) [see preceding abstract] in man and animals, the writer concisely summarizes the known facts concerning this phenomenon in relation to a number of other mycoses.

Hruszek (H.). **Untersuchungen über die pleomorphe Entartung von Dermatomyzeten. II. Mitteilung: 'Biologische' Pilznährböden.** [Studies on the pleomorphic degeneration of Dermatomycetes. Note II: 'Biological' nutrient media for fungi.]—*Derm. Wschr.*, cii, 19, pp. 622–623, 1936.

Pleomorphic degeneration in cultures of *Achorion gypseum* [*R.A.M.*, xiv, p. 580] on expressed onion juice was prevented by the previous growth on the same medium of wine-, press-, or baker's yeasts and *Monilia* [*Candida*] *pinoysimilis* [ibid., xiii, p. 162].

Dósa (A.). **Über Paronychia und Onychia blastomycetica (Panaritium blastomyceticum).** [On paronychia and onychia blastomycetica (panaritium blastomyceticum).]—*Derm. Wschr.*, cii, 18, pp. 582–584, 1936.

Associated with the twelve cases of paronychia and onychia recently examined at the Franz Josef University Clinic, Szeged, Hungary, were species of *Saccharomyces*, *Oidium*, and *Cryptococcus* [cf. *R.A.M.*, xv, p. 21]. Previous observations on these conditions are briefly summarized and the difficult problem of their cure discussed.

Mitchell (L. A.). **Torulosis.**—*J. Amer. med. Ass.*, cvi, 6, pp. 450–452, 1 fig., 1936.

Full clinical details are given of a fatal case of torulosis in a 53-year-old male Chinese. Members of the genus *Torula* are stated to be separable from the higher yeasts in their failure to form endospores or mycelia and from the Saccharomycetes in their pathogenicity and habitual non-fermentation of sugars [*R.A.M.*, xv, pp. 367, 502]. Representatives of this group grow readily on all laboratory media, the maximum development being made on Sabouraud's at room temperature. The cultures survive desiccation for a period of several months. The pathogenicity of these organisms to laboratory animals varies considerably, rabbits being practically immune, guinea-pigs, rats, and mice very susceptible. Cases of spontaneous infection in animals are on record. The most characteristic changes induced by torulosis are encountered in the central nervous system. The spinal fluid contains many yeast cells to which there is little or no reaction on the part of the host.

Bolsunova (Mme O.). Новый метод искусственного заражения семян Льна культурой **Polyspora lini.** [A new method of artificial infection of Flax seeds with *Polyspora lini.*]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 107–108, 1935. [Received July, 1936.]

By the method of inoculation described in this paper flax seeds are

placed in a thin layer on the bottom of Petri dishes, covered with a large bell jar, and atomized with a spore suspension of *Polyspora lini* [*R.A.M.*, xv, p. 441], the jet being directed from under the rim of the jar upwards, so that the seeds are inoculated by the fine mist of the suspension settling slowly upon them. The seeds are then collected in large flasks and left to dry in them for from two to four hours, no slime being produced. The inoculated seed gave 99·3 per cent. infection of the mature plants in September, as against 0·6 per cent. in the controls.

Kazina (Mme O.). Влияние степени зараженности семян Льна полиспорозом на пораженность посевов и урожай. [The influence of the degree of Flax seed infection with *Polyspora lini* on the amount of injury to the crop and on yield.]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 110–115, 1935. [English summary. Received July, 1936.]

The investigation briefly described in this paper was made in 1934 in the Leningrad region, following observations indicating the comparatively slow but steady spread of *Polyspora lini* [see preceding abstract] in several flax-growing areas of the U.S.S.R. of recent years. Seed of the highly susceptible flax variety A-776 was inoculated with a spore suspension of the fungus, and sown either alone or mixed in varying proportions with uninoculated seed in the middle of May; although it germinated poorly it was for all practical purposes attacked by *P. lini* alone. The tabulated results of the test showed that up to 8·5 per cent. infected seed did not appreciably affect the quality and quantity of yield in fibre and seeds; 10 to 15 per cent. reduced the yield of fibre by 6 to 11 per cent. and of seed by 8 to 15 per cent.; 15 to 25 per cent. by 13 to 15 and 20 to 25 per cent., respectively, and 100 per cent. infected seed by 20 to 25 and about 30 per cent., respectively. The first symptoms of the disease appeared at the bud formation stage of the flax plants in the form of breaking of the stems at the base, which appeared to be the point of entry of a *Fusarium* sp. which rapidly killed the plants.

Flor (H. H.). **Flax seed-treatment tests.**—*Phytopathology*, xxvi, 5, pp. 429–438, 1936.

A tabulated account is given of four years' trials in the control of seed-borne diseases of flax, e.g., seedling blight (*Colletotrichum lini*), browning (*Polyspora lini*) [see preceding abstracts], wilt (*Fusarium lini*), and damping-off (*Pythium* and *Rhizoctonia* spp.) at eleven stations in Minnesota, North and South Dakota, and Montana. During the period under review *F. lini* was the only trouble of any importance, and none of the treatments used in one year's tests appreciably modified its incidence in the susceptible Damont variety either on infested or non-infested soils [*R.A.M.*, xi, p. 182]. None of the treatments consistently stimulated either stand or yield, though under the relatively humid conditions of south-eastern Minnesota a certain amount of benefit may be expected to result from the use of copper carbonate or ceresan at the rate of 4 oz. per bush. The formalin spray (1 in 320, 1 gall. per bush.) caused severe injury in some of the experi-

ments. It is concluded that, in general, flax seed treatment is not warranted in the regions under observation.

WILLIAMS (P. H.). **Rose diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 37–42, 1936.

In further investigations at Cheshunt into rose rust [*R.A.M.*, xiv, p. 638] nine strains of *Phragmidium* when tested for their ability to infect seven rose varieties fell into four groups. One strain from *Rosa laxa* and one from *R. rugosa* were found capable of infecting the rose, but strains from *R. canina* could not be transferred to it. There was no difference in the sizes of the uredospores of the different groups, but in the strains from cultivated roses 6-celled teleutospores were most abundant, 7- or 8-celled spores being commonest in the strains from briars, 7-, 8-, and 9-celled spores in a strain from *Rosa laxa*, and 7-celled spores in the remaining strains; with a few exceptions the average length of each class of spore was very close in all the strains, though when measurements of the 7-celled spores were tested statistically it was found that the rose strain examined was significantly different from the briar strains, while the latter were not significantly different from one another. Attempts to germinate the teleutospores each month were successful only during May, and only in the case of spores previously stored outdoors. [An account of this work is also given by W. F. Bewley in *Rose Annu.*, *1936*, pp. 106–114, 1936.]

SHELLEY (A. D. G.). **Black spot.**—*Rose Annu.*, *1936*, pp. 118–120, 1936.

In connexion with a popular account of black spot of roses, the writer points out that only the imperfect (*Actinonema*) stage of the causal organism, *Diplocarpon rosae* [*R.A.M.*, xv, p. 582], is known to occur in England, a fact that considerably simplifies control. In addition to such cultural measures as the excision and burning of diseased material, light autumn and drastic spring pruning, and the removal in early winter of the surface layers of soil from infected beds, the writer recommends two dormant applications, at a 10- to 14-day interval, of a solution of $\frac{3}{4}$ oz. copper sulphate per gall. of water, followed in the spring, and at least three times later in the season, by spraying with 3 pints sulsol [ibid., xiv, p. 560], 2 pints bouisol, and $\frac{1}{4}$ lb. lethalate [ibid., xiii, p. 104] per 100 galls. Agral N [ibid., xii, p. 744] may be substituted for lethalate, in which case 1 lb. is sufficient for 40 galls. of spray.

[PAGE (C.).] **Canker.**—*Rose Annu.*, *1936*, p. 115, 2 pl., 1936.

The cankers caused by *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, xv, pp. 22, 468] may affect any part of a rose stem, sometimes occurring at the junction of the stock, as in Maréchal Niel. On varieties of the rambler type (the most generally susceptible), such as Emily Gray, Albéric Barbier, and American Pillar, the stems gradually become encircled by large, wart-like excrescences and finally die. The spores of the fungus gain access to the tissues through small wounds [ibid., ix, p. 722] made by the rose spines, by friction between

the shoots, or by hailstones. All diseased material should be excised and burnt, and the cut surfaces coated with painters' knotting. Knives or other implements should be disinfected to prevent dissemination.

WHITE (H. L.). **A survey of Carnation 'stem rot' diseases, 1925–35.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 43–46, 1936.

Notes are given on a number of carnation diseases observed during the period 1925 to 1935 in the vicinity of Cheshunt. During prolonged damp periods in winter a wilt due to a species of *Botrytis* is common, but could probably be eliminated by increased temperature. The diseases caused by species of *Fusarium* fall into two groups, (*a*) those due to semi-parasitic species and (*b*) those due to actively parasitic species, such as *F. dianthi* [*R.A.M.*, xv, p. 584]. Among the soil-inhabiting species belonging to the former group, *F. scirpi* var. *acuminatum* appears to be the commonest, having been isolated in a high percentage of cases from carnation roots attacked by *Verticillium cinerescens* [ibid., xv, p. 225]. In some instances the fungus appeared to be pathogenic. *F. culmorum* [loc. cit.] was present in up to 70 per cent. of carnation roots infected by *V. cinerescens*, and the evidence obtained indicated that it can behave as a very active pathogen. Two types of infection by *F. culmorum* may be due to a contaminated water supply, viz., a foot rot of unrooted cuttings, in which infection spreads rapidly at high temperatures through moist sand, and a slow wilt. In the latter type of disease infection occurs at the junction of the main limbs where water collects after spraying, and the lesions spread very slowly in relatively cool conditions. Lesions due to *F. culmorum* are common in the pith and cortex of carnation plants, and in the wood for distances of a few inches, but as a rule the fungus does not cause a true vascular wilt.

Mention is also made of *Rhizoctonia* collar rot, which, though rare, may cause serious losses, and is believed to be associated with moist, heavy soil; *Sclerotinia* collar rot, causing the whole plant to wilt, observed only once; and *V. cinerescens*, at present the most important carnation disease in England [see next abstract].

WHITE (H. L.). **Verticillium wilt of the Carnation.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 46–50, 1936.

In further studies on carnation wilt (*Verticillium cinerescens*) [see preceding abstract] isolations from cuttings from diseased plants were successfully inoculated into healthy carnations and the fungus was re-isolated from 24 out of 30 plants.

Six young carnation plants of the Spectrum variety inoculated with *V. cinerescens* on 31st May, 1935, developed complete wilt in periods ranging from 45 to 106 days, the mean rate of growth of the fungus being nearly 0·6 cm. per day in June and July, as compared with 0·4 cm. during September and October in an earlier experiment.

Inoculations in triplicate with 21 cultures, mainly species of *Fusarium*, isolated from the cortex and roots of wilting carnations infected by *V. cinerescens* gave negative results with one exception, apparently a strain of *F. culmorum* [loc. cit.]; it is concluded that the fungi were

secondary, having invaded the tissues following primary infection by *V. cinerescens*. From further inoculations (by pricking at the basal joints of a single shoot) with eight strains of *V. cinerescens* on 32 carnation plants of the Topsy and Spectrum varieties definite evidence of differential varietal susceptibility was obtained, Topsy being the more susceptible to strains 3, 5, 6, and 8, Spectrum to strain 4. Contrary to previous reports [ibid., xii, p. 633], *V. cinerescens* was not found pathogenic to asters.

AINSWORTH (G. C.). **Detection of spotted wilt virus in Chrysanthemums.** —*Nature*, cxxxvii, 3473, p. 868, 1936.

It has been found that the use of 0·5 per cent. solution of anhydrous sodium sulphite in preparing an extract of chrysanthemum leaf containing the spotted wilt virus [*R.A.M.*, xv, p. 444] facilitates the detection of the latter in tests on inoculated tobacco leaves; in one experiment 16 lesions resulted from the sulphite-prepared extract of half-leaves compared with 0 from the water extract of the remaining halves. The symptoms of the disturbance in chrysanthemum are ordinarily of a somewhat indefinite nature, and the difficulty of detecting infection, even in plants known to be infected, may be due to the inactivation of the virus by the oxidizing enzymes or oxidation products present in the juice.

BLUMER (S.). **Die Ausbreitung des Löwenmaulrostes (Puccinia antirrhini Dietel et Holway).** [The distribution of the Snapdragon rust (*Puccinia antirrhini* Dietel & Holway).]—*Mitt. naturf. Ges. Bern, 1935*, pp. xxvi–xxvii, 1936.

In connexion with the detection in the summer of 1935 of *Puccinia antirrhini* on *Antirrhinum majus* [*R.A.M.*, xv, p. 442] in and around Berne, the writer briefly considers the spread of the fungus and some other rusts from their places of origin to different parts of the globe and the parallel expansion of their circle of hosts.

OYLER (E.) & BEWLEY (W. F.). **A disease of cultivated Heaths.**— *Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 50–56, 1936.

In a further study of the wilt of *Erica hiemalis*, *E. nivalis*, and *E. willmoreana* previously reported as associated with a *Phytophthora* [*R.A.M.*, xiv, p. 637] the authors found that inoculations of healthy branches of *E. hiemalis* with pure cultures of the organism (identified by S. F. Ashby as *P. cinnamomi* [ibid., xv, p. 378]) caused wilting within six days. Infection was obtained by inoculating lateral branches, the main stem at soil-level, the soil of pots containing healthy plants, and by standing pots containing healthy plants on sterilized ashes infected with a pure culture of the fungus. Inoculations on *E. gracilis* gave negative results, confirming the experience of growers as to the resistance of this species. The fungus was, however, found capable of infecting *Antirrhinum*, beech seedlings, calceolaria, and *Schizanthus*, of causing gall formation at the point of inoculation in *Nicotiana glutinosa* stems, and of rotting apple and tomato fruits.

Cultural studies showed that the compost used for the raising of

heaths is a very favourable medium for the growth of *P. cinnamomi*; rain-water, greatly favoured by growers for watering purposes, was more conducive to the growth of the fungus than tap-water.

No evidence was obtained that the disease starts in the propagating houses. As plants became infected when placed on infected ashes it is apparent that sterilization of the 'standing-out' ground in which the plants are placed after removal from the glasshouse is essential after each crop. The water in the tanks was found to contain large quantities of the organism, and therefore constituted a serious source of contamination. Balls of compost and roots from unmarketed plants used for mulching and other purposes were ascertained to be a third source of contamination.

Control should be based on improved sanitary methods and the use of Cheshunt compound as a soil disinfectant [ibid., xiv, p. 637]. Copper sulphate, because of its low cost and safety, is recommended for disinfecting the standing-out ground. Peat from the neighbourhood of beech trees should not be used in making the compost.

VAN SLOGTEREN (E.). **De beteekenis van klimaat- en transport-invloeden voor de gebruikswaarde van tuinbouwproducten, in het bijzonder van bloembollen. Een phytopathologisch-physiologisch onderzoek.** [The influence of climatic and shipping conditions on the demand for horticultural products, especially flower bulbs. A phytopathological and physiological study.]—*Tijdschr. PlZiekt.*, xlii, 5, pp. 117–158, 48 figs., 1 diag., 5 graphs, 1936. [English summary.]

The writer discusses, on the basis of investigations at the Bulb Research Laboratory, Lisse, Holland, the influence of environmental conditions, such as humidity and temperature, during storage and shipping on the flowering capacity of bulbs. In this connexion reference is made to the similarity of the effect of overheating the bulbs to attack by yellow rot (*Pseudomonas hyacinthi*) [*R.A.M.*, xv, p. 298]. The external aspect of a bulb is not necessarily a reliable index of its flowering capacity, which may not be adversely affected by superficial injuries caused during transit by mites or secondary fungi (e.g. *Penicillium glaucum* and *Aspergillus niger*), while conversely, apparently sound material may be worthless owing to damage from overheating at this period. Special attention should be paid to the elimination of this factor and others tending to lower the marketable value of the bulbs.

DAME (F.). **Die Grauschimmelkrankheit der Tulpen, ihr Auftreten und ihre Bekämpfung.** [The grey mould disease of Tulips, its occurrence and control.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 18, p. 207, 4 figs., 1936.

Heavy damage is stated to be inflicted on tulips in Germany by grey mould [*Botrytis tulipae*: *R.A.M.*, xv, p. 508], the symptoms of which are briefly described]. Control may be effected by clean cultivation, supplemented by half-an-hour's immersion of the bulbs in 0·25 per cent. uspulun; at the commencement of forcing and two days later the bulbs may again be disinfected by pouring the same solution over them.

Gomez-Menor (J.). **Hongos que ocasionan daños a las plantas 'Flor de Sol'.** [Fungi that damage Sunflower plants.]—*Rev. Agric., S. Domingo*, xxvii, 80, 2415, 1936.

Popular notes are given on the occurrence and control in the Dominican Republic of *Rhysotheca* [*Plasmopara*] *halstedii* [*R.A.M.*, xii, p. 571], *Erysiphe cichoracearum* [ibid., xiii, p. 804], and *Phragmidium* sp. on sunflower leaves.

Barthelet (J.) & Gaudineau (Mlle M.). **Les maladies des Cyclamens.** [Cyclamen diseases.]—*Rev. Path. vég.*, xxiii, 2, pp. 101–122, 3 pl., 6 figs., 1936.

In the summer of 1935 several thousand cyclamens [*Cyclamen persicum*] growing near Paris showed abortion of the floral buds as a result of infection by *Gloeosporium cyclaminis* [*R.A.M.*, v, p. 741: xi, p. 650], not previously recorded in France. Affected plants commonly showed a withering of the leaf buds when 1 to 3 cm. long, but infection sometimes appeared at a later stage of development, lesions being formed on the petioles and on the peduncles near the flower, in which case the partially opened flowers withered and fell off at the least touch. Brown depressed spots, 2 to 3 cm. long, were occasionally noted on the peduncle of flowers already open, and rarely light brown, then blackish, triangular sectors were found on the petals. On the leaves circular depressed spots, 5 or 6 mm. in diameter, may also be due to the fungus. Infected material showed the presence of conidiophores, measuring 30 to 40 by 3 μ, and oblong-cylindrical conidia, 16 to 17 by 3·5 to 5 μ. The fungus grew freely in culture and on oat agar produced an abundant white mycelium which after a few days formed conidial stromata and darkened in colour owing to the development of a pseudo-stromatic layer; the conidia were rose colour in the mass. Inoculations with pure cultures through punctures on the branches and young buds rapidly reproduced the symptoms of the disease. A test with a commercial mixture of copper oxychloride indicated that applications with this mixture made early in summer would afford adequate protection to cyclamens grown either in the open or under glass.

In 1930 eight or ten different cyclamen varieties growing near Paris showed light punctiform spots on the floral buds which later reached 2 or 3 mm. in diameter, and sometimes became confluent; the flowers became dwarfed and deformed. Infected material showed the presence of a *Fusarium* resembling *F. avenaceum* with 5- to 7-septate spores with a not very evident basal cell, measuring 90 by 4 to 6 (average 80 by 4·75) μ.

Brief notes are given on the following cyclamen leaf diseases: *Phyllosticta cyclaminis* [loc. cit.], *Glomerella rufomaculans* [ibid., ix, p. 765], *Phoma cyclamenae* [ibid., vi, p. 164], and *Botrytis cinerea*.

Servazzi (O.). **La colletotricosi o maculatura fogliare della Calla.** [Colletotrichosis or leaf spot of Calla Lily.]—*Boll. Lab. sper. e Ren. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 1–2, pp. 10–11, **1936.**

The leaves of Calla lilies (*Zantedeschia*) *ethiopica* growing in glasshouses

near Turin bore round or elliptical, sharply defined, isolated or confluent, dark-olivaceous spots 2 to 10 mm. in diameter, with a light, ochraceous-yellow, round centre, showing the presence of *Colletotrichum montemartinii*, with pointed, light yellow setae 100 to 130 μ long and up to 6 μ in diameter at the base, and generally curved, cylindrical or ellipsoidal conidia, up to 25 by 5 μ. Numerous wild *Arum italicum* plants growing in the vicinity were also infected, and the author considers that the disease may have spread from these to the Calla lilies. On partly withered leaves of *A. italicum* a *Phyllosticta*, regarded as a secondary parasite, was also occasionally found in association with *C. montemartinii*.

Preliminary tests on *A. italicum* indicated that satisfactory control of the disease may be obtained by the destruction of badly infected leaves and spraying with 1 per cent. naphthol β [ibid., xiii, p. 790] with 0·35 per cent. of sodium carbonate. Wild *A. italicum* plants near the glasshouses should be destroyed.

Taubenhaus (J. J.) & Ezekiel (W. N.). **Fusarium crown and root rot, and Sclerophoma stem blight, of the Texas Bluebell.**—*Bull. Torrey bot. Cl.*, lxii, 9, pp. 503–510, 2 figs., 1936.

This is an expanded account of the writers' investigations on crown and root rot (*Fusarium solani*) and *Sclerophoma* stem blight (*S. eustomonis* n.sp.) of the Texas bluebell (*Eustoma russellianum*), a preliminary note on which has already appeared [*R.A.M.*, xiii, p. 448]. *S. eustomonis* [English and Latin diagnoses of which are given] is characterized by dark-coloured, flattened, lenticular pycnidia embedded in a stromatic layer in the cortical tissue of the host, 135 to 300 μ in diameter by 85 to 145 in depth, and by cylindrical, continuous, hyaline conidia, 4·5 to 8·7 by 2·1 to 3·1 μ (mean 6·8 by 2·5 μ), borne on short conidiophores with almost invisible tips. The fungus was shown to be disseminated by the mealy bugs (*Pseudococcus maritimus*) which commonly attack *E. russellianum*. A strain of the flower with narrow leaves has manifested a high degree of resistance to *S. eustomonis*.

Pannier (R.). **Flagellose d'une Euphorbe des environs de Banyuls-sur-mer.** [Flagellosis of a *Euphorbia* in the vicinity of Banyuls-sur-mer.]—*C.R. Soc. Biol., Paris*, cxxii, 19, pp. 374–377, 9 figs., 1936.

Euphorbia exigua plants were found to be parasitized to the extent of 20 per cent. by flagellates ranging in diameter from 5 to 24 μ, the larger individuals (of which torsion was a conspicuous feature) resembling *Herpetomonas tortum* and the smaller ones approximating in dimensions and nuclear characters to *H.* [*Leptomonas*] *davidi* [*R.A.M.*, xiii, p. 254]. In the writer's opinion only one species (the latter) is involved, the large contorted individuals being merely older and not essentially distinct from the small ones.

Demolon (A.) & Dunez (A.). **La fatigue des sols. Cause et remèdes.** [Soil exhaustion. Cause and remedies.]—*C.R. Acad. Sci., Paris*, ccii, 20, pp. 1704–1706, 1936.

Further data are presented to exemplify the close connexion between the presence in lucerne plants of the bacteriophage of *Bacillus radicicola*

and the failure of the crop [*R.A.M.*, xiv, p. 743 and next abstract]. The elimination of the bacteriophage from lucerne fields and the reintroduction into the soil of lysis-resistant, polyvalent cultures of *B. radicicola* are briefly discussed.

VANDECAVEYE (S. C.) & KATZNELSON (H.). **Bacteriophage as related to the root nodule bacteria of Alfalfa.**—*J. Bact.*, xxxi, 5, pp. 465–477, 2 figs., 1936.

A potent lytic principle active against *Rhizobium meliloti* [*Bacillus radicicola*] was isolated from ten soils from the Yakima district of Washington and round Ellensburg carrying lucerne stands three or more years old [see preceding abstract] and from the root tissue of three-year-old plants in one field. Indications of the presence of a lytic principle were detected in the poor development of the nodules. The possible role of bacteriophage in the reduction of lucerne yields is briefly considered, but definite conclusions on this point are reserved pending further studies.

YARWOOD (C. E.). **The diurnal cycle of the powdery mildew Erysiphe polygoni.**—*J. agric. Res.*, lii, 9, pp. 645–657, 1 diag., 1936.

The salient features of this amplified account of the writer's studies on the diurnal cycle of clover powdery mildew (*Erysiphe polygoni*) [see next abstract] have already been noticed from another source [*R.A.M.*, xiv, p. 174]. In preliminary investigations of *E. polygoni* on cabbage [ibid., viii, p. 4] similar relationships were established, but no definite variations in responses to day and night were expressed by conidial germination in *E. graminis* on barley [ibid., xv, pp. 568, 585].

YARWOOD (C. E.). **Host range and physiologic specialization of Red Clover powdery mildew, Erysiphe polygoni.**—*J. agric. Res.*, lii, 9, pp. 659–665, 1 fig., 1936.

Fourteen *Trifolium* species out of 20 tested in the field, in the greenhouse, and in dish cultures showed varying degrees of susceptibility to powdery mildew (*Erysiphe polygoni*) [see preceding abstract] from red clover (*T. pratense*), including *T. lupinaster*, *T. striatum*, *T. angustifolium*, *T. hybridum*, and *T. squarrosum*; *T. repens* reacted positively in the field and very slightly in dish cultures, but not in the greenhouse.

Three physiologic forms of the fungus were distinguished on the basis of differences in the reaction to inoculation of certain red clover clones [*R.A.M.*, iv, p. 431]. One of these forms appears to be very widespread in the United States and Canada, while the two others are of rare occurrence.

These investigations were greatly facilitated by the culture of *E. polygoni* on living excised clover leaflets floating on a 10 per cent. sucrose solution [ibid., xiii, p. 773].

KUSANO (S.). **On the parasitism of Olpidium.**—*Jap. J. Bot.*, viii, 2, pp. 155–187, 8 figs., 1936.

The results of inoculation experiments with *Olpidium viciae* from *Vicia unijuga* on *V. faba* and peas [*R.A.M.*, xi, p. 720] indicated that the juice from vigorous portions of the hosts contains sufficient

potassium to exert a positive chemotactic stimulus on the pathogen equivalent in strength to that of a 1/10 mol. solution of potassium chloride. No other substances residing in the host cells attract the fungus in the same way as potassium, which may also occur in non-host plants of *O. viciae*, such as tomato and *Dahlia variabilis*, in combination, however, with toxic or repellent principles counteracting the chemotactic stimulus normally exerted by potassium. This element not only attracts the swarm cells of the fungus to the surface of the host cell but also assists the penetration of the infection-tube through the wall. The profuse excretion of potassium to the surfaces of the young parts of the host is thought to explain the susceptibility of the latter to infection by *O. viciae*, and conversely the failure of the fungus to enter the older portions is attributed to the sparse output of potassium at this stage rather than to any mechanical impediment.

Whenever the swarm cells encyst upon the cell surface they exercise an invading action on the cell, against which the plant reacts by the formation of more or less extensive deposits of callus round the infection-tube. In susceptible hosts (e.g., *V. unijuga*, *V. faba*, and peas) most of the tubes penetrate the callus, in the less congenial hosts (e.g., *Impatiens balsamina*, *Taraxacum platycarpum*, and *Oenothera* spp.) the callus is more effective in defence, while in some non-host plants (e.g., *Chrysanthemum sinense* and lettuce) it prevents infection altogether. Four types of callus formation are distinguished, viz., button or peg, filamentous, sac-like, and thick conical or cylindrical, the latter two preventing the infection-tube from entering the cell cavity. Resistance, therefore, is considered to depend on two factors: (1) the presence of a defensive substance according to the nature or amount of which the parasite may be prevented from approaching the cell, probably from entering it after reaching its surface, or from developing after entering it; and (2) callus formation. It is suggested that haustorial parasites may show an analogous relation to the host plant, the host cell selected for haustorial invasion containing in some cases both attractive and defensive substances, the former diffusing outside the cell and the latter remaining within and acting injuriously on the developing haustorium.

EASTHAM (J. W.). **The relation between climate and the incidence of some orchard diseases in British Columbia.**—*Proc. fifth Pacif. Sci. Congr., 1933*, iv, pp. 3229–3232, 1935.

The three regions devoted to commercial fruit-growing in British Columbia may be differentiated into (1) the moist coastal belt; (2) the arid interior plateau and valleys, including the Okanagan Valley and the southern tip of Vancouver Island where the low annual rainfall necessitates artificial irrigation; and (3) an inland district of moderate precipitation and fairly low winter temperatures comprising the Arrow Lake and Kootenay country.

The most characteristic disease in area (1) is apple anthracnose (*Neofabraea malicorticis*) [*R.A.M.*, xv, p. 481]. In (2) physiological diseases are responsible for heavy damage, while fireblight (*Bacillus amylovorus*), first definitely recorded in 1912, assumed a virulent form until it was effectively combated by improved control methods and rigid official inspections. The chief epidemic disease in area (3) is apple

scab (*Venturia inaequalis*), which may be serious in the northern part of the valley, where precipitation reaches 15 in. or more per annum, but is practically unknown south of Kelowna, where the excessively dry summer atmosphere apparently prevents the development of the fungus on the leaves, so that there is no primary inoculum in the spring. In the Fraser Valley *S. americana* [*S. fructicola*: ibid., xv, pp. 531, 592] is destructive on stone fruits in wet seasons. Blossom blight of sweet cherries (*Monilia oregonensis*) is virulent in the south of Vancouver Island [ibid., xiv, p. 495], but perennial canker of apples (*Gloeosporium perennans*) [ibid., xiii, p. 523] does not seem to be spreading with great rapidity.

Holz (W.). **Zur Färbung des Myzels von Fusicladium dendriticum in Apfelblättern.** [On the staining of the mycelium of *Fusicladium dendriticum* in Apple leaves.]—*Zbl. Bakt.*, Abt. 2, xciv, 9–13, p. 195, 1936.

Further experiments on the technique of staining to detect the presence of the mycelium of *Fusicladium dendriticum* [*Venturia inaequalis*] in apple leaves [*R.A.M.*, xv, p. 28 and next abstract] have shown that a cotton blue solution (50 gm. each of phenol, lactic acid, and glycerine and 1 gm. of cotton blue to 100 gm. of distilled water, used at the rate of 1 part of the solution to 9 of water) is sufficient for this purpose without preliminary treatment with gentian violet. The stained leaves should be washed in water until the veins are sky-blue; the other steps in the method are as previously recommended.

Winkelmann (A.) & Holz (W.). **Beiträge zur Biologie und Bekämpfung des Apfelschorfes (Fusicladium dendriticum [Wallr.] Fckl.). II.** [Contributions to the biology and control of Apple scab (*Fusicladium dendriticum* [Wallr.] Fckl.) II.]—*Zbl. Bakt.*, Abt. 2, xciv, 9–13, pp. 196–215, 4 figs., 4 graphs, 1936.

Continuing their studies in the Berlin district on the life-history and control of apple scab (*Fusicladium dendriticum*) [*Venturia inaequalis*: *R.A.M.*, xiv, p. 589], the writers found that from 1st November until the beginning of January the increase in perithecial diameter was very slight, being hindered rather than promoted by high temperatures, which are essential, on the other hand, to the process of maturation. The liberation of the ascospores takes place most actively during rain following a brief warm spell in the spring, frequency rather than quantity of precipitation being the decisive factor in the extent of the discharge. In 1935 the first ascospores on fallen leaves in the open were detected on 2nd April and dispersion was virtually concluded by 26th May; the first ascospores were trapped in the air on 10th April and the last on 18th May. Leaves exposed to temperatures of 12° and 18° C. on 18th February (when perithecial development was complete) discharged ascospores after 13 days.

The optimum temperature for infection by *V. inaequalis* was experimentally shown to be about 19° [ibid., xv, p. 480], the incubation period being 9 to 14 days in the case of ascospores and 8 to 10 in that of conidia. Seedling trees kept in the dark prior to inoculation showed heavier infection than those exposed to the light, evidently as a result

of metabolic disturbances. At temperatures below 10° conidial and mycelial infections were accompanied by the formation of appressoria, which only developed under warmer conditions when hyphal penetration was impeded by external agencies. In a few of the seedlings belated infections, manifested by the appearance of pale spots on the leaves 10 to 14 days after inoculation, caused serious damage.

Good control of scab was obtained by three applications of 1 per cent. Bordeaux mixture on 14th, 20th, and 26th April, the earliest date anticipating the first copious dispersal of ascospores, the second preceding and the third coinciding with the most prolific distribution of these organs.

Crowell (I. H.). **Index to the relative susceptibility of orchard Apples to Cedar-Apple rust.**—*Phytopathology*, xxvi, 5, pp. 459–461, 1936.

The following method is employed by the writer for the determination of the reactions of orchard apples to cedar-apple rust (*Gymnosporangium juniperi-virginianae*) [*R.A.M.*, xiv, p. 771; xv, pp. 484, 487]. Varieties with leaves bearing no evident infection spots are classed as immune and those with 1 to 5, 6 to 15, and 16 or more aecidia per lesion (this number having been found to be directly related to the number of lesions per leaf) as slightly, moderately, and very susceptible, respectively. Intermediate between the immune and slightly susceptible groups is the 'spermogonial host' category, comprising those varieties on which infection results solely in spermogonial development. For all practical purposes such hosts may be regarded as highly resistant, since the rust cannot be perpetuated in the absence of aecidia.

Hildebrand (E. M.) & Phillips (E. F.). **The honeybee and the beehive in relation to fire blight.**—*J. agric. Res.*, lii, 10, pp. 789–810, 1 fig., 1 graph, 1936.

This is an amplified account of the work on honeybees [*Apis mellifica*] in relation to apple and pear fireblight (*Erwinia amylovora*) [*Bacillus amylovorus*: *R.A.M.*, xv, p. 589] which has already been briefly described by the first-named writer [ibid., xiv, p. 370]. Using a synthetic culture solution as a base, the maximum sugar concentrations permitting the growth of the organism in dextrose, levulose, artificial nectar, and sucrose were 30, 30, 35, and 58 per cent., respectively. Bees were found to be instrumental in spreading the disease in two ways, (1) by conveying the bacteria from the hive to the fruit blossoms, and (2) by disseminating the inoculum from flower to flower. Transmission in the first instance, however, is conditional on the active feeding of the insects on contaminated food.

Rosen (H. R.). **The influence of dry air on the longevity of the fireblight pathogen.**—*Phytopathology*, xxvi, 5, pp. 439–449, 1 fig., 1936.

In air-dry exudate of *Bacillus amylovorus* [see preceding abstract] attached to blighted pear twigs and exposed to laboratory air at Fayetteville, Arkansas, for varying periods, the organisms were found to be dead at the end of a year. On the other hand, they were still

viable and infectious about a year after being placed over concentrated sulphuric acid in an atmosphere approaching a relative humidity of zero. Fireblight exudate kept in corked vials suspended from an apple limb in an orchard yielded no viable bacteria after a period of less than three months, while viability was apparently lost within three weeks of extrusion by infective material left *in situ* on a cankered pear trunk exposed to direct sunlight during the intensely dry summer of 1934. No viable bacteria were detected in 67 soil samples from beneath severely blighted apple and pear trees during the winter of 1934–5, but owing to the imperfect technique at present available, these results are regarded as inconclusive. Viable bacteria kept under extremely dry conditions for about a year stained violet or violet-red by the Proca-Kayser method (*J. Bact.*, xxvii, p. 175, 1934), whereas the dead ones were coloured clear red.

Riker (A. J.), Palmiter (D. H.), & Hildebrand (E. M.). **Some environmental factors influencing the development of hairy root on Apple.**—*J. agric. Res.*, lii, 9, pp. 715–721, 1 fig., 3 graphs, 1936.

The outstanding results of the authors' studies on the relation of certain environmental factors to the development of hairy root (*Phytomonas* [*Bacterium*] *rhizogenes*) on apple, of which this is an expanded account, have already been noticed from another source [*R.A.M.*, xiv, p. 369].

De Long (W. A.). **Variations in the chief ash constituents of Apples affected with blotchy cork.**—*Plant Physiol.*, xi, 2, pp. 453–456, 1936.

Analysis of two sample lots of Fallawater apples from the same orchard, one of which was affected with blotchy cork (known locally as bitter pit) [*R.A.M.*, xiii, p. 170; xv, p. 446], showed that the affected and unaffected fruits contained, respectively, 0·052 and 0·071 gm. calcium per 1,000 gm. fresh weight. Two years later, five samples of 30 apples each of the Stark variety were gathered directly from the trees at Windsor Forks and Kentville, Nova Scotia, and classified as affected (*a*) very severely, (*b*) severely, (*c*) slightly to moderately, or (*d*) unaffected, though in some cases from susceptible trees, and (*e*) from trees never affected with any disorder of the cork type; the amount of calcium present in the parings and flesh of each sample was then determined and expressed as a percentage of the quantity found per unit of fresh weight in the healthy sample (*e*), the figures obtained for the five samples being, respectively, 40, 51, 62, 68, and 100 per cent. for the parings, and 59, 67, 67, 79, and 100 per cent. for the flesh. The cause of this apparent calcium deficiency in the affected fruit is uncertain, but data obtained indicated that it may result from competition for this element between leafy shoot and fruit tissues during the early stages of growth.

Güll (A.). **Über das Glasigwerden der Äpfel.** [On the glassiness of Apples.]—*Obst- u. Gemüseb.*, lxxxii, 5, p. 71, 1936.

A semi-popular note is given on glassiness of apples [*R.A.M.*, xiii, p. 316] which is attributed either to drought or superabundant

nutrition, the condition in the former case being associated with a not unpleasant juiciness and sweetness, whereas in the latter the flavour is disagreeably insipid. The White Astrachan variety appears to be particularly liable to glassiness, but Golden Pearmains, Charlamovski, and other varieties may also be similarly affected.

REEVES (E. L.). **Mottle leaf of Cherries.**—*Proc. Wash. St. hort. Ass. 1935*, xxxi, pp. 85–89, 1936. [Abs. in *Hort. Abstr.*, vi, 2, p. 111, 1936.]

The symptoms of mottle leaf of cherry [*R.A.M.*, xv, p. 480] are described, with observations on its detrimental effects on the fruit. Microscopic examination has revealed neither fungi nor bacteria in the diseased tissues, and injections of salts of zinc, copper, and iron gave negative results. Transmission of the disease to healthy trees has been effected, however, by budding and grafting (not root grafting) both from rootstock to scion and vice versa. Affected trees (which seem to be incapable of recovery) should be removed as soon as they cease to be commercially productive.

EASTWOOD (H. W.). **Destruction of Banana plants. Experiments prove that oils are too costly.**—*Agric. Gaz. N.S.W.*, xlvii, 4, pp. 193–199, 15 figs., 1936.

In a banana eradication test carried out in New South Wales 16 Cavendish banana stools were treated with applications of 1 to 6 pts. of oil [*R.A.M.*, xiv, p. 13; xv, p. 76]. Promising results were obtained only with five stools, treated with either 6 pts. power kerosene (sp. gr. 0·805 to 0·81, closed f.p. 105° F.), 2, 4, or 6 pts. light gas oil (0·81 to 0·83, f.p. 155° to 160°), or 4 pts. Diesel oil (0·865, f.p. 180° to 190°). Heavy Diesel oil was a failure. The lowest rate of successful application (2 pts. per stool) amounts to 100 galls. per acre, which at the lowest price of any of the oils used works out at £3 15*s.*, or including the lowest cost of labour, a minimum of £5 10*s.* per acre, as against £4 to £5 per acre for uprooting and cutting up the plants. The use of oils for the eradication of banana plants, therefore, is uneconomic and cannot be recommended save in exceptional cases where special circumstances make the cost of digging-out excessive.

UPPAL (B. N.). **India: a serious disease of Guava in Bombay.**—*Int. Bull. Pl. Prot.*, x, 5, p. 99, 1936.

Physalospora psidii [*R.A.M.*, xiii, p. 269] has been observed in Dholka and North Gujarat, Bombay Presidency, causing a severe disease of guava. Infection originates in the bark and spreads rapidly along the stem from one branch to another, resulting in desiccation, cracking, decortication, death of the affected parts, and finally of the whole tree. Numerous perithecia of the causal organism were found scattered over the dead bark.

ADAMS (J. F.) & PRIODE (C. N.). **Fungicide No. 66.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 40–45, [1936].

In an investigation of a large number of detergents and their derivatives as fungicides, preparation no. 66 (an organic sodium

sulphonate) showed marked potential fungicidal efficacy. For field use its adherent properties have to be increased by the addition of bentonite [see below, p. 666] and hydrated lime, each 0·1 per cent. Applications of this spray at 0·3 per cent. concentration to beans growing in the greenhouse made when the first leaves were expanded and again twice at fortnightly intervals efficiently controlled powdery mildew [*Erysiphe polygoni*]. The control of apple scab [*Venturia inaequalis*] given by this fungicide in a season extremely conducive to infection compared favourably with that given by lime-sulphur on all varieties used except Paragon, while the control of sooty blotch [*Gloeodes pomigena*] and fly speck [*Leptothyrium pomi*] was as good as that given by either lime-sulphur or Bordeaux mixture. No foliage injury was caused by the fungicide, and the finish of the fruit was commercially excellent.

The new fungicide has no conspicuous residue, is compatible with insecticides, possesses some insecticidal properties, and is a heavy wetting agent; as a sulphur wetting agent it must be carefully used to prevent extreme flocculation.

Adams (J. F.). **Sulphur fungicides.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 48–54, 1 graph, [1936].

Laboratory tests with apple scab [*Venturia inaequalis*] spores demonstrated that the toxicity of lime-sulphur (2 in 100) was lowered by the addition of hydrated lime (5 lb.), but re-established by adding 3 lb. lead arsenate, and that a similar reduction was caused by the addition of catalytic sulphur (4 lb.) [*R.A.M.*, xv, p. 518].

In field tests carried out in 1935, however, rather better scab control was given by lime-sulphur (1 in 100) plus catalytic sulphur (4 lb.) than by lime-sulphur alone on four out of five apple varieties. The same held true of sooty blotch [*Gloeodes pomigena*] and fly speck [*Leptothyrium pomi*]. The catalytic sulphur treatment gave much more vigorous foliage and much brighter fruit, with considerably less russeting than did the lime-sulphur alone.

In a study by P. D. Peterson it was ascertained that by resorting to wet grinding sulphur can be ground to a much smaller particle size than is possible with present methods of dry grinding. Preliminary field tests on apples in 1934 with wet-milled sulphur gave promising results, and in 1935 the control of apple scab given in one trial by this product (containing 5 lb. pure sulphur per 100 galls.) was quite outstanding, even though the season strongly favoured infection. In another orchard Stayman, Nero, Paragon, and Rome varieties treated with wet-milled sulphur developed, respectively, 10·9, 10·2, 19·8, and 4·8 per cent. scab, the corresponding figures for another block treated with lime-sulphur (pre-blossom) and flotation sulphur being 10·1, 9, 10·4, and 4·4 per cent.

Adams (J. F.) & Nikitin (A. A.). **A new copper fungicide.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 73–80, [1936].

A new copper fungicide has been developed in Delaware and tested under field conditions during a period of three years. Chemically it is a synthetic copper zeolite, containing approximately 25 per cent.

metallic copper in combination with ingredients which render it non-hygroscopic and non-caustic. It is chemically very stable, leaves no conspicuous residue, adheres so well that stickers are not needed, and causes much less injury than other copper fungicides.

Comparative spraying tests conducted in two apple orchards in 1934 and 1935 [the results of which are tabulated] showed that, generally speaking, the new fungicide gave better control of scab (*Venturia inaequalis*), fruit spot (*Phoma* [*Mycosphaerella*] *pomi*), sooty blotch [*Glocodes pomigena*], and fly speck [*Leptothyrium pomi*] than any of the standard sprays used. Combined with lime-sulphur or wet-milled sulphur [see preceding abstract] it gave considerable promise as an efficient and economical fungicide, and the data obtained also showed that it reduced fruit russeting to a minimum. For average conditions of scab control a concentration of 1 lb. of the new fungicide per 100 galls. is recommended.

GROVES (A. B.). **Fungicides in relation to foliage injury and fruit yield.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 58–60, [1936].

In discussing spray injury of fruit trees under the climatic conditions prevailing in the Peninsula region of Virginia, the author states that lime-sulphur frequently causes considerable foliage injury and also increases arsenical injury, particularly in wet or humid weather. The wettable sulphurs, as a rule, cause comparatively little injury when used alone, except in very hot weather. Bordeaux mixture sometimes causes injury (especially on the fruit) in cool or humid weather, but a weak mixture (2–4–100 or 3–6–100) is generally safe in Virginia. A great merit of Bordeaux mixture is that it acts as a corrective for soluble arsenic, and should always be used with calcium arsenate whether needed as a fungicide or not.

YOUNG (H. C.) & BECKENBACH (J. R.). **Spreader materials for insoluble copper sprays.**—*Phytopathology*, xxvi, 5, pp. 450–455, 1 fig., 1 graph, 1936.

The effectiveness of a number of insoluble copper compounds as substitutes for Bordeaux mixture has been somewhat disappointing owing to their lack of adhesiveness [*R.A.M.*, xiv, p. 382], and the experiments recorded in this paper were made with the object of finding a spreader that would correct this defect. The materials used were bentonite [ibid., xv, p. 592], wyojel (Wyoming bentonite with a low percentage of magnesium oxide) [ibid., xiii, p. 715], talc, Bancroft clay, and flour with basic copper sulphate, basic copper chloride, and copper phosphate, and the method adopted was to atomize glass slides with the mixture, the deposit after drying and washing being taken up with hydrochloric acid and the copper determined colorimetrically. Wyojel and bentonite gave the best results, and in further tests with basic copper sulphate (2 lb. per 50 galls.) the former at 2 to 10 lb. (the highest tested) gave residues of 94·96 to 98·1 per cent., whereas bentonite gave 95·5 to 96·3 per cent. at between 2 and 4 lb., but less at higher proportions. Wyojel was also superior to bentonite in tests with coposil [ibid., xiv, pp. 591, 683].

READ (W. H.). **Insecticide and fungicide investigations.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 73–78, 1936.

Good control of tomato leaf mould [*Cladosporium fulvum*: *R.A.M.*, xiv, p. 662; xv, p. 407] and cucumber mildew [*Erysiphe cichoracearum*: ibid., xii, p. 744] was obtained at Cheshunt by adding ½ oz. of a proprietary copper oxychloride powder to a diluted oil emulsion, but in order to obtain results as good as those given by a proprietary copper oxychloride suspension it was necessary to add such quantities of copper oxychloride to the oil emulsion that the deposit on the fruits became excessive. Cuprous cyanide was ineffective against the latter disease.

The incompatibility of shirlan H.B. [ibid., xiii, pp. 10, 496; xiv, p. 9] and petroleum emulsion sprays was ascertained to be due to the solubility of salicylanilide in the petroleum resulting in injury to the plants.

In further tests with the copper-oil spray used at Cheshunt against rose rust (*Phragmidium* sp.) [see above, p. 653] and mildew [*Sphaerotheca pannosa*] an increase in the amount of emulsifying and wetting material (hydrolysed glue) reduced the undesirable foliage marking caused by the spray but also diminished the fungicidal value of the latter. The original mixture of one part of copper oleate dissolved in two parts of cottonseed oil, followed by emulsification with three parts of a 20 per cent. solution of hydrolysed glue, finally gave the best results even allowing for the injury it caused. Of many fungicides tested against rose mildew the combined copper oxychloride and petroleum emulsion now obtainable commercially under the name 'bouisol [ibid., xv, p. 481] and white oil emulsion' gave the best results, the product being used at a dilution of 1 oz. in 5 pts. of water.

MARTIN (H.). **Developments in the chemistry of fungicides used on farm crops.**—*Agric. Progr.*, xiii, pp. 105–112, 1936.

The author reviews the present position of the use of fungicides in agriculture, particularly with regard to Bordeaux mixture (the physical and chemical properties of which are discussed) and dusts designed to replace it, and seed disinfectants. A table is given showing the composition of a number of well-known proprietary seed disinfectant preparations, from which it is seen that a marked reduction has taken place in the mercury content of these from 18 per cent. down to 1·5 per cent. for agrosan G [*R.A.M.*, xv, pp. 558, 565] (tolyl mercury acetate) and ceresan (phenyl mercury acetate).

DILLON WESTON (W. A. R.) & BOOER (J. R.). **Seed disinfection. I. An outline of an investigation of disinfectant dusts containing mercury.**—*J. agric. Sci.*, xxv, 4, pp. 628–649, 1 pl., 8 graphs, 1935.

In preliminary tests of inorganic and some organic compounds of mercury mixed with a filler as seed disinfectants against leaf spot of oats (*Helminthosporium avenae*) and wheat bunt (*Tilletia tritici*) [*T. caries*] the former were valueless, but mercuric phenate and mercuric thiocyanate showed some promise.

Mercuric phenate is of complex chemical composition, but its chief constituents are ortho- and para-hydroxy benzene mercury hydroxide, the acetate of which was chiefly used in further experiments. Whilst this compound was only moderately effective as a seed disinfectant,

[illegible]

[illegible]

[illegible]

Treatment at 600 gm. per cu. m. concentration did not affect adversely the viability of pea, cucumber, cabbage, and rape seed, but considerably lowered the germinability of soy-bean, hemp, maize, beet, and cotton seeds; the latter effect may be due in part to insufficient aeration of the seeds after treatment, and also to the fact that the hydrogen sulphide used contained traces of hydrochloric acid.

KVASHNINA (Mme E. S.). Фунгисидные свойства сероводорода. [Fungicidal properties of hydrogen sulphide.]—*Bull. Pl. Prot., Leningr., 1935*, Ser. iii (Control measures and implements), 6, pp. 57–64, 1935. [English summary. Received August, 1936.]

The results of laboratory tests in 1934 at the Azoff-Black Sea Plant Protection Station, in which wheat, barley, oats, maize, and cabbage seed, contaminated with various parasitic and saprophytic fungi (*Tilletia tritici* [*T. caries*], *Ustilago* spp., *Puccinia* spp., *Fusarium* spp., *Helminthosporium* spp., *Alternaria*, *Aspergillus*, *Penicillium*, and *Botrytis cinerea*), were exposed for periods of from 48 to 168 hours to concentrations of 13·3 to 40 per cent. hydrogen sulphide at temperatures from 8° to 35° C., showed that all the organisms were effectively controlled by the treatment, higher temperatures being more important for the efficacy of the treatment than an increase in the length of exposure or in the concentration of the gas [cf. preceding abstracts]. Field tests showed uniformly good control of the diseases involved; treated seed-grain of the winter wheat Ukrainka gave equal or slightly denser stands than those raised from control seed, a slight decrease in density only occurring with treated seed of the winter wheat Co-operatorka; considerably denser stands were obtained from treated seed of winter barley. In every case the stands given by seed-grain treated with hydrogen sulphide were slightly to considerably denser than those obtained from formalin treated seed. The experiments are being continued in view of the comparative cheapness and ease of application of the treatment and the present shortage of fungicides in the U.S.S.R.

EDELMAN (N. M.). Действие сероводорода на семена. [Effect of hydrogen sulphide on seeds.]—*Bull. Pl. Prot., Leningr., 1935*, Ser. iii (Control measures and implements), 6, pp. 65–67, 1935. [English summary. Received August, 1936.]

Laboratory tests in 1934 at the Azoff-Black Sea Plant Protection Station, in which the seeds of 24 varieties of field crops (wheat, oats, sunflower, and flax) and of 15 varieties of vegetables were exposed for 24 to 28 hours to atmospheres containing from 200 to 500 gm. hydrogen sulphide [see preceding abstracts] per cu. m., showed that none of the seeds tested was injured by the treatment, except those of tomatoes (the germinability of which was reduced by from 2 to 6 per cent.), while in some cases their germination was increased by from 2 to 10 per cent. and more.

SPARROW (F. K.). **Biological observations on the marine fungi of Woods Hole waters.**—*Biol. Bull. Woods Hole*, lxx, 2, pp. 236–263, 3 pl., 35 figs., 1936.

Descriptions are given of 15 species of Phycomycetous marine fungi

[cf. *R.A.M.*, xiv, p. 59] (including two new genera and two new species, with Latin diagnoses), all collected in the vicinity of Woods Hole, Massachusetts, and with one possible exception, new to the United States, 14 being found on marine algae and one on microscopic animal eggs. The existence of true marine fungi, their work as one of the several types of 'reducers' in the sea, and their potential importance in the formation of marine humus are discussed. It is further mentioned that the species of *Labyrinthula* [ibid., xv, p. 453] associated with the wasting disease of *Zostera* in North America has been observed by the writer in diseased material of the plant from the Kattegat (1933) [ibid., xiv, p. 709] and Plymouth Harbour (1935).

Budrina (Mme A.). Методы фитопатологической экспертизы семян. [Methods for the phytopathological examination of seeds.]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 13–22, 1935. [Received July, 1936.]

The author surveys the standardized methods for the phytopathological analysis of crop seeds introduced when the practice was made compulsory over the whole territory of the U.S.S.R. in 1934. The subject is discussed under the headings of external examination of seed samples, and biological and anatomical methods, with an indication of the advantages and drawbacks in each case.

Birkeland (J. M.). **On the classification of plant viruses.**—*Phytopathology*, xxvi, 5, pp. 456–458, 1936.

In addition to the criteria proposed by J. Johnson and Miss Hoggan for the classification and diagnosis of plant viruses [*R.A.M.*, xiv, p. 521], recent work indicates that serological and induced immunity reactions [ibid., xiii, p. 545] may also be useful for this purpose, revealing relationships not always apparent from the symptoms displayed by the various hosts. In this connexion mention is made of the common phenomenon of mutation in certain viruses. By growing infected plants at high temperatures or selecting portions of diseased leaves showing varying gradations of colour, it is possible to isolate strains 'breeding true' for these particular features which, if encountered in nature, would undoubtedly be regarded as new and named according to the symptoms observed on their hosts. There is reason to believe that insects act as disseminators of such variant viruses, a multiplicity of which may therefore be expected to arise, characterized at first by divergent symptoms but essentially identical in origin. A table is given, prepared from the author's own data, supplemented by those of Kunkel [ibid., xiii, p. 648] and Caldwell [ibid., xiv, p. 600], demonstrating the striking parallelism between the serological reactions of a number of plant viruses and the degree of acquired immunity from those viruses in plants.

Rischkow (L. W.). **Ultravirus und Immunität.** [Ultravirus and immunity.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 153–166, 1936. [French summary.]

In this survey of the question of immunity of plants from virus diseases the author states that among plants individual resistance to

virus attack is seldom observed, though some species are resistant to certain viruses. Individual resistance depends largely on the age of the host, plant embryos being resistant to most virus diseases. The majority of plant viruses show little specialization; one and the same virus can attack representatives of different families, although some genera and species may show individual resistance to it. There are instances where immunity is due to the presence of inactivating substances in the sap, e.g., *Datura*, which is naturally immune from tobacco mosaic. Cases of symbiosis between virus and host and of antagonism between viruses have been wrongly interpreted by some workers as evidence of acquired immunity. After recovery from virus infection plants may carry the same virus in a latent state, but no definite proof has yet been produced that plants can show true acquired immunity to diseases caused by filterable viruses.

Smith (K. M.) & Doncaster (J. P.). **The particle size of plant viruses.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 179–182, 1936. [French summary.]

The authors briefly discuss Elford's method for the calculation of the size of virus particles [*R.A.M.*, xv, p. 306] by means of which the following sizes were determined: potato virus X, 75 to 112 $\mu\mu$; tomato streak virus, 30 to 45 $\mu\mu$; tobacco necrosis virus [ibid., xiv, p. 798], 20 to 30 $\mu\mu$; tobacco virus 1, 18 to 27 $\mu\mu$; and a new tomato virus, 17 to 25 $\mu\mu$ [not 25 to 27 $\mu\mu$, as given in error: ibid., xv, p. 264]. Passage through graded collodion membranes is one means of separating mixtures of plant viruses and even mixtures of strains of the same virus [ibid., xv, p. 122].

Ainsworth (G. C.). **Virus diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 56–62, 1936.

The tomato disease characterized by severe leaf distortion of the fern-leaf type and the presence of enations on the underside of the leaves, reported last year from Hertfordshire [*R.A.M.*, xv, p. 264], is now attributed to a strain of tobacco virus 1. The virus is filterable unchanged through Pasteur-Chamberland filters, has a thermal death-point of 90° C., and is resistant to ageing *in vitro*; immunity studies showed that it was incapable of infecting a plant previously inoculated with tobacco virus 1, and mixed inoculations with it and potato virus X on tomatoes resulted in typical mixed virus streak [ibid., xv, p. 535]. The symptoms resemble those of fern leaf of tomato caused by cucumber virus 1, but differ in the leaf enations.

A mosaic disease of watercress (*Nasturtium officinale*), causing yellow mottling and slight deformation of the leaves with slight stunting of the plants, was shown to be due to cucumber virus 1.

An interesting instance of recovery from spotted wilt was afforded by three flowering *Hippeastrum* [*calceolaria*] plants [ibid., xiv, p. 662]. These were severely affected when potted up, and as usual the soil was allowed to dry out, the bulbs being watered again in late autumn; the following spring all three plants appeared to be quite healthy and no virus could be detected in them.

Carter (W.). **Insects and plant diseases.**—*Proc. Hawaii. ent. Soc.*, ix, 2, pp. 159–170, 2 diags., 1936.

This is a discussion on the relationship between insects and certain plant diseases [*R.A.M.*, xv, p. 241], with special reference to the mealy bug wilt and green spotting of pineapple leaves in Hawaii associated with infestation by *Pseudococcus brevipes* [ibid., xiv, p. 457; xv, p. 451]. Mention is further made of the yellow spot virus of the same host [ibid., xiv, p. 456] and some general comparisons are drawn between the effects of insect-secreted toxins and those of viruses.

Burges (A.). **On the significance of mycorrhiza.**—*New Phytol.*, xxxv, 2, pp. 117–131, 1936.

From a critical review of the literature and his own observations the author concludes that the presence of the fungus in a mycorrhizal association [*R.A.M.*, xv, p. 520] is to be regarded as an example of controlled parasitic attack without mutualistic significance. For instance, working with *Orchis incarnata* he obtained from the roots enzymatic substances which disintegrated the hyphae, reducing those in culture to a shrivelled, oily mass within three to four days. A similar action probably takes place during the digestion of arbuscles. Ectophytic mycorrhiza, on the other hand, are probably due in part to stimulation by the phosphatides shown by Melin [*R.A.M.*, v, p. 246] to be excreted by the roots. Most of the phenomena associated with mycorrhiza can be interpreted as effects of parasitism and mycorrhizal fungi may be placed in the category of weak parasites controlled by the reactions of the host cells.

Distinct from mycorrhizal activity is that due to soil fungi breaking down the organic matter in the soil into water-soluble components, which thus become available to the higher plant and may be absorbed by its roots in amounts corresponding to the degree of saprophytism. The soil organisms responsible for the decomposition are not necessarily mycorrhizal fungi, but some occur regularly as endophytes in the roots.

Castellani (E.). **Influenza dei prodotti di escrezione di alcuni funghi isolati dall'apparato radicale della Barbabietola sulla germinazione del Mais.** [The influence of the excretory products of certain fungi isolated from the root system of Beet on the germination of Maize.]—*Nuovo G. bot. ital.*, xlii, 4, pp. 614–622, 1935. [Received July, 1936.]

It has frequently been observed in the lower valley of the Po that the growth of maize is adversely affected when planted in association with sugar beet or in rotation with this crop. The author therefore investigated the microflora of the sugar beet roots and in the course of his study isolated *Penicillium* sp., *Cladosporium* sp., *Stysanus stemonites* [*R.A.M.*, xiv, p. 196] in association with *Stachybotrys alternans*, *Mucor mucedo*, *M.* sp., *Macrosporium* [?*Pleospora*] *herbarum*, *Geomyces vulgaris* (possibly identical with *Verticillium monosporioides*) [ibid., xi, p. 641], *Fusarium* sp., *F. orthoceras*, and *Geotrichum candidum* [ibid., xiv, p. 383]. He then ascertained that the fluid from pure

cultures of these organisms reduced the germinability of maize seed, *M. herbarum*, *G. vulgaris*, *F. orthoceras*, *F.* sp., and *G. candidum* being particularly active in this respect. Although in the field wheat appeared to be unaffected by the sugar beets, a similar laboratory test to the foregoing also reduced the germination of wheat seed. Further investigations are in progress.

BUTLER (E. J.). **The nature of immunity from disease in plants.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 1–16, 1936. [French summary.]

In considering the problem of plant immunity [*R.A.M.*, xv, p. 389] the author emphasizes that as a rule the reaction of plant tissues is confined to the immediate neighbourhood of the infection site. Inherent or congenital resistance is, with few exceptions, influenced, apparently, by environmental conditions. Five kinds of acquired immunity are distinguished, viz., (1) that which follows an initial infection, and which has been definitely established only in the case of certain virus diseases, (2) local immunity following an initial infection, the recorded examples of which are not very convincing, (3) immunity acquired through vaccination [loc. cit.], in connexion with which it is pointed out that antibodies have not yet been demonstrated to be present in plants, (4) acquired intracellular immunity, and (5) immunity acquired by symbiosis, which may vary if the environmental conditions change.

The author concludes that analogies between animal and plant diseases should be confined within the limits of cellular pathology. In plants acquired immunity (wherever it has been established with certainty) appears to be no more than an intracellular phenomenon. No evidence has yet been produced to show that in plants anti-parasitic action takes place at a distance remote from the immediate infection site.

DUFRÉNOY (J.). **Le rôle des amino-acides et des composés phénoliques dans la susceptibilité ou la résistance des plantes aux maladies.** [The role of amino-acids and phenolic compounds in the susceptibility of resistance of plants to diseases.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 16–38, 7 figs., 1936.

From his study of the reaction of plant cells to infection the author concludes that the main factor in the establishment of local immunity is the ability of the plant to produce phenolic compounds in the cells. What generally occurs is that in the cells adjacent to those first infected, two series of antagonistic reactions are set up, the relative speed of which determines susceptibility or resistance. In one form of these reactions the cells revert to the meristematic condition [*R.A.M.*, xv, p. 453], in the other phenolic compounds accumulate in the vacuolar solution; both types of reaction may coexist in one cell, at opposite poles. If the phenolic cells become differentiated so rapidly that the parasite cannot set up any nutritional relations with them, immunity results. On the other hand, if the parasite passes through the reacting cells before they become differentiated into phenolic cells, then the infection becomes generalized, and the plant is susceptible.

Gäumann (E.). **Les facteurs de la susceptibilité et de la résistance des végétaux aux maladies parasitaires.** [Factors involved in the susceptibility and resistance of plants to parasitic diseases.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 39–63, 5 graphs, 1936.

From a review of the factors determining the susceptibility or resistance to disease in plants, the author concludes that in the vegetable kingdom, attack by the parasite is active, and the plant passive, with the result that passive protection is much more important than immunity-reaction, i.e., active defence. In animals and man, on the other hand, the parasite is introduced into the body passively, taking no active part in the process, while the host displays intensely active immunity-reactions. Active defence in such cases is at least equal in importance to passive protection. In addition to the general humoral reaction, which is associated with the blood, the animal kingdom also shows a cellular, local immunity-reaction which probably has close analogies with the local immunity-reactions of plants. Certain plants undoubtedly possess the ability to produce anti-bodies, but these reactions are exclusively local, being restricted to the tissues immediately surrounding the centre of infection. The author considers that pathology is approaching a time when it will be possible to consider plant and animal disease from the same point of view.

Carbone (D.). **Le reazioni umorali delle piante.** [The humoral reactions of plants.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 65–72, 1936. [French summary.]

On the basis of the evidence available the author considers that the formation of true antibodies in plants has not yet been definitely established [cf. *R.A.M.*, xiv, p. 713], and briefly describes known cases of the diffusion of defensive substances into liquids and jellies from plant tissues placed in them *in vitro*; the formation of defensive substances by plants is well established, and pseudo-antibodies should probably be included among them also.

Magrou (J.). **La phagocytose chez les végétaux.** [Phagocytosis in plants.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 73–81. 1936.

Applied to plants, the term phagocytosis is defined by the author as the digestion of microscopic parasites by the cells into which they have penetrated. The process is best known in plants possessing endotrophic mycorrhiza. When the seeds of Orchidaceae are entered by the symbiotic fungus some of them destroy the mycelium by intracellular digestion, thus arresting the invasion; symbiosis then cannot be established, and germination does not occur. This may be compared with the recovery of animals from infectious diseases as a result of the destruction of the microbes by the phagocytes. In other seeds, the 'phagocytes' instead of completely destroying the fungi only delay their advance, and in such cases symbiosis can become established. It is concluded that the phenomenon described as plant phagocytosis may play an important part in plant immunity.

Politis (J.). **Immunité et hérédité chez les végétaux.** [Immunity and heredity in plants.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 83–95, 1936.

Discussing the part played by certain chemical substances in the defence of the plant against parasitic diseases the author refers to numerous cases in which parasitic stimulation causes the elaboration of anthocyanic pigments, phenolic compounds, tannoids, and the like, which are all said to exert a toxic action toward the parasite. In the second part of the paper is considered the role of the vacuole in relation to heredity and the elaboration of new materials.

Reed (H. S.). **Cellular nutrition and immunity.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 97–106, 1 fig., 1936. [French summary.]

The living constituents of the plant cell are characterized by constant mobility and lability, but the cell tends to maintain its integrity by a continual re-establishment of equilibrium between its constituents. The degree of hydration of the vacuoles determines susceptibility to infection. Dehydration often accompanies the chemical modifications tending to increase immunity in plants; the concentration of salts increases in the vacuoles, the sugars are changed into polysaccharides, pentoses, and other bodies which contain less water and are therefore less readily absorbed by invading organisms. Recent discoveries have shown that plants are able to acquire immunity probably by antibodies, in the formation of which nutrition plays an important part; in other cases immunity may be due to the production of phenolic compounds in the host cells. Significant results have been obtained in experiments with germanium, zinc, and boron in relation to immunity, and further research is needed on this aspect of the problem.

Brooks (F. T.). **The resistance of trees to lignicolous fungi.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 135–142, 1936. [French summary.]

Discussing the reactions shown by various susceptible and resistant plum varieties to invasion by *Stereum purpureum* the author states that resistance appears to be associated with the formation of gum barriers [*R.A.M.*, xi, p. 59]. A susceptible variety may become resistant following a change in metabolism. He suggests that gum formation in the xylem plays an important part in the resistance set up to other fungi that attack the sapwood, and considers that the formation of tyloses in the wood vessels may arrest some types of invasion and so play a part in resistance.

Salaman (R. N.). **Immunity to virus diseases in plants.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 167–178, 1936. [French summary.]

In this full review of the data regarding immunity from virus diseases in plants, the author contrasts this immunity with that found in animals, commenting on the lack of evidence for the existence of antibodies in plants, and classifies the types of immunity as real or apparent (when plants recover from symptoms but remain infective). A further type is afforded by carriers. True immunity may be local

or systemic; active acquired immunity has been demonstrated but no examples of passive acquired immunity are known. The author concludes that while immunity in animals is largely humoral and only to a minor extent cellular in character, in plants it is largely if not entirely cellular.

SĂVULESCU (T.). **L'immunité aux maladies bactériennes des plantes. [Immunity to bacterial diseases of plants.]**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 183–251, 1936.

In the first part of this detailed account of present information on plant immunity to bacterial diseases the author deals with the question of resistance, the chief points discussed being mechanical resistance and physiological resistance, the latter considered under the headings of chemical resistance, resistance by pseudo-antibodies, resistance by intracellular digestion and by other means, and, finally, factors influencing natural resistance. The second part deals with the principles of acquired immunity, and is followed by other sections treating of passive, serological immunity, anaphylaxis, and bacteriophages. The author concludes that while the mechanism of plant immunity is not always comparable with that in animals, there are indications that the same laws govern immunity phenomena in all living things, that the use of vaccines, curative sera, and bacteriophages in the therapy of infectious plant diseases is a problem already solved in theory, and that it is now possible to make a synthesis of the pathogenesis of plant and animal diseases considered from the same point of view, in the general framework of comparative pathology.

A bibliography of 299 titles is appended.

TILFORD (P. E.). **The relation of temperature to the effect of hydrogen- and hydroxyl-ion concentration on Sclerotinia fructicola and Fomes annosus. Spore germination and growth.**—*Bull. Ohio agric. Exp. Sta.* 567, 25 pp., 6 graphs, 1936.

The effect of hydrogen-ion concentration on conidial germination in *Sclerotinia fructicola* [*R.A.M.*, xv, p. 161 and above, p. 661] after 24 hours in mannite solutions was found to be closely connected with temperature in respect of the P_H limits for germination, the widest reaction range (1·4 to 7·2) occurring at 21° C. Temperature limits were likewise influenced by the reaction. For instance, at P_H 1·8 and 7·2 germination took place only at a range of 17° to 25°, whereas at from P_H 2 to 6·6, it occurred throughout the scale from 13° to 33°. Germination was inhibited at all reactions at temperatures of either 8° or 40°. The optimum reaction for spore germination was near P_H 2·4 at all the temperatures tested, except at 33°, when a hydrogen-ion concentration of about 5·6 was more favourable. At reactions of P_H 2 and 6·6 germination was most profuse at 21°, while it reached a climax at 24° with reactions of 2·4 and 5·6; at 3·6 the optimum temperature range extended from 21° to 29°. Double maximum germination curves were obtained throughout the experimental temperature range, the minimum coinciding with the isoelectric point at P_H 6 [cf. ibid., ix, p. 197].

Both *S. fructicola* and *Fomes annosus* produced large quantities of acid on potato dextrose and malt agar. Generally speaking, the growth

curves for both fungi followed a straight line throughout the duration of the tests, ignoring the lag phase. The hydrogen-ion was found to be much less toxic to the test fungi than the hydroxyl, the adverse effects of the former being more pronounced at the upper temperature limits for growth and those of the latter in the lower range. *S. fructicola* developed better on potato dextrose than on malt agar, while *F. annosus* preferred the latter. The optimum hydrogen-ion concentrations for *S. fructicola* on potato dextrose agar at 10° to 24°, 25° to 26°, and 27° to 30° were near P_H 3·79, 3·79 to 4·16, and near 5·85, respectively. For *F. annosus* the optimum reactions on malt agar at 20° to 23° and 26° to 40° were P_H 4·91 and 5·32, respectively. The temperature coefficients for both fungi were found to vary greatly throughout the temperature range, being largest near the bottom and smallest towards the top of the scale.

Manil (P.). **Contribution à l'étude de l'immunité chez les plantes.** [A contribution to the study of immunity in plants.]—Reprinted from *Mém. Acad. R. Belg. Cl. Sci.*, Sér. 2, xv, 49 pp., 8 pl., 1936.

The results of experiments carried out to investigate some of the factors involved in plant immunity showed that stem inoculations with *Bacterium tabacum* and *Bact.* [*Pseudomonas*] *syringae* [*R.A.M.*, xv, p. 515] produced typical lesions for each organism on plants of widely separated genera. In tobacco *Bact. tabacum* was found chiefly in the xylem, the lesions present along the veins being due to the rapid development of zoogloeae at the ends of the neighbouring vessels. In lilac and beans (*Phaseolus* sp.) *P. syringae* chiefly attacked the collenchyma and perivascular tissues. This tropism may explain some cases of natural immunity associated with the anatomical structure of the host. The lowest P_H value tolerated by either organism was about 5·85 and this may account for the immunity of *Pelargonium zonale* (with sap of P_H 4·56) towards these parasites. Osmotic pressure was found to inhibit entirely the development of both bacteria in concentrated solutions whereas the saprophytic *Bacillus coli* and *B. fluorescens* were much less affected. Fresh plant extracts had no marked specific action on either *Bact. tabacum* or *P. syringae*. Power of agglutination of the bacteria by plant extracts was found to be in no way related to natural immunity and the expressed juice of leaves containing *Bact. tabacum* after filtration through Chamberland candles was not toxic. The 'immunity barriers' of necrosed tissue set up in tobacco leaves inoculated with *Bact. tabacum* and *B. fluorescens* were about equally thick. Further experiments indicated that a strictly local and very temporary immunization follows vaccination with *Bact. tabacum* antiserum and that root absorption by bean seedlings of a culture filtrate of *P. syringae* resulted in acquired hypersensitiveness, a kind of special allergy.

Baldacci (E.). **A proposito della vaccinazione nelle piante superiori.** [On vaccination in the higher plants.]—*Nuovo G. bot. ital.*, **xlii,** 4, pp. 599–603, 1935. [Received July, 1936.]

With reference to his recently published investigations on the so-called 'vaccination' of plants [*R.A.M.*, xv, p. 389], the author discusses

the views that have been put forward by various workers as to the precise nature of the toxicity of the 'vaccines'. No satisfactory evidence is forthcoming that vaccines have any optimum concentration; it is, moreover, arbitrary to assume that the most toxic doses of a 'vaccine' are necessarily those best adapted for purposes of vaccination, which has to be regarded as an intoxication phenomenon to which the plant reacts by changes in the osmotic pressure of its sap.

Reddick (D.). **Seed transmission of Potato virus diseases.**—*Amer. Potato J.*, xiii, 5, pp. 118–124, 1936.

In 1934 three or four out of 2,000 potato seedlings in screened cages at Ithaca, New York, showed symptoms very suggestive of acropetal necrosis [*R.A.M.*, xv, p. 459] and later others developed indeterminate pathological features of various types until finally a total of 52 were counted. Five of the tubers from these plants failed to grow, but 39 yielded progeny with similar symptoms to those of the parents, while 8 gave rise to apparently healthy plants. Among 1,500 seedlings grown in 1935, 18 showed symptoms comparable to those observed in the previous year. Inoculation tests with the diseased material on virus-free President plants demonstrated conclusively that the virus concerned was in fact that of acropetal necrosis, most or all of the aberrant types being merely varietal responses to the same infective principle. Evidence is briefly adduced for the transmission of the virus by means of the pollen, but absolutely conclusive proof of this means of communication is not forthcoming.

Potato leaf roll developed in 75 per cent. of the progeny of plants infested in their seedling stage by *Myzus persicae*, the seedlings being raised in proximity to plants affected by leaf roll. Of the three aphids locally concerned in the spread of true leaf roll, viz., *M. persicae*, *Macrosiphum solanifolii* [*M. gei*], and *M. pseudosolani*, the first-named is the most active [ibid., xv, p. 483].

While emphasizing the value of healthy foundation stock for breeding purposes, the writer points out that an affected individual plant of great value may in general be safely used as either parent in hybridization, provided that the first crop of seedlings is grown under insect-proof conditions.

Foëx (E.). **Au sujet de la Pomme de terre et des maladies dites de dégénérescence.** [On the subject of the Potato and of the so-called degeneration diseases.]—*C.R. Acad. Agric. Fr.*, xxii, 14, pp. 573–576, 1936.

The writer fully agrees with Crépin's summing-up of the potato degeneration situation [*R.A.M.*, xv, p. 597] except for his statement on the transmissibility by insects of the diseases responsible for the condition, which has not been proved in the case of mosaic (comprising the common, interveinal, Up-to-Date streak, and top necrosis types [see preceding abstract]). In addition to the relative abundance of aphids, their periods of maximum activity are also of importance in connexion with the incidence of virus infections in a given locality. Great stress must be laid on the absolute necessity of isolated sites for selection plots, the vicinity of fields, market-gardens, or any enclosure containing

Solanaceae or cabbages (on which *Myzodes* [*Myzus*] *persicae* often overwinters), as well as of orchards [cf. ibid., xiii, p. 461] being strictly avoided. Particularly suitable for the purpose are clearings in the midst of softwood forests, since the aphid is not harboured by conifers.

Foëx (E.) & Lansade (M.). **L'action pathogène d'une forme de Fusarium oxysporum isolée de la Pomme de terre.** [The pathogenic action of a form of *Fusarium oxysporum* isolated from the Potato.] —*C.R. Acad. Sci., Paris,* ccii, 21, pp. 1812–1813, 1936.

Disinfected healthy potato tubers of the Institut de Beauvais and Fin de Siècle varieties were planted in pots containing partially sterilized soil inoculated with a form of *Fusarium oxysporum* distinct from the American variety [*R.A.M.*, xv, p. 252] isolated (*a*) from wilted potato plants in Brittany and (*b*) from a tuber sent from Morocco. In about one-fifth of the 70 plants in the inoculated soil foliar wilting (absent in the controls) was apparent; the fungus was detected in the vessels and in the root, collar, and stem parenchyma, reisolated, and again inoculated into a fresh lot of tubers with positive results. The faintly discoloured vascular ring of the tuber is frequently the site of a bacterial rot [see next abstract].

Foëx (E.) & Lansade (M.). **Action pathogène d'une bactérie isolée de tubercules de Pommes de terre.** [The pathogenic action of a bacterium isolated from Potato tubers.]—*C.R. Acad. Sci., Paris,* ccii, 23, pp. 1939–1941, 1936.

From the wet rot in the vicinity of the vascular ring of potato tubers infected by *Fusarium oxysporum* [see preceding abstract] a bacterium, identified by Stapp as *Bacterium xanthochlorum* [*R.A.M.*, v, p. 574], was isolated which induced typical symptoms of decay in tubers inoculated (*a*) by placing a culture on a cut section, and (*b*) by immersing a young tuber (about the size of a walnut) in a bacterial suspension for 30 hours, infection in the latter case taking place through the lenticels. Reisolation was effected in both instances. Positive results were also obtained in inoculations on leaves of potato, tobacco, *Solanum aethiopicum*, *S. rantonnetii* (reisolation from two first-named), pea, broad bean [*Vicia faba*], and haricot [*Phaseolus vulgaris*] (reisolation from last-named). The organism was further inoculated into, and reisolated from, seedlings of *Datura aegyptiaca* Vesl. [*D. fastuosa L.*], *D. ecklonis* Lind., *Hyoscyamus niger*, *S. topiro*, *S. humile*, and *S. nigrum* var. *chlorocarpum*. [A condensed account of these investigations appears in *C.R. Acad. Agric. Fr.*, xxii, 20, pp. 726–730, 1936.]

Bawden (F. C.), Pirie (N. W.), & Spooner (E. T. C.). **The production of antisera with suspensions of Potato virus 'X' inactivated by nitrous acid.**—*Brit. J. exp. Path.*, xvii, pp. 204–207, 1 diag., 1936.

In experiments with purified suspensions of potato virus X [*R.A.M.*, xv, p. 390] no significant difference was detected between the sera of rabbits injected intravenously with the active virus and of those injected with virus inactivated by nitrous acid. Both types of antiserum fixed complement and flocculated with active or inactivated

virus suspensions, but not with the sap of healthy tobacco plants, and both were equally effective in neutralizing the virus *in vitro*.

MANNS (T. F.). **Control of Sweet Potato wilt.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 46–47, [1936].

Sweet potato wilt [or stem rot: *Fusarium batatatis* and *F. hyperoxysporum* (*F. oxysporum* f. 2): *R.A.M.*, xiv, p. 150], which has caused severe losses in Delaware, especially on light soils in hot, dry periods, is stated to disappear when the sweet potato is kept off the land for a time. Control depends on eliminating infection from the seed and then keeping the seed healthy by seed-bed sanitation and rotation. Hill selection at digging is necessary; only medium-sized potatoes should be taken for seed, and they should be stripped, dried, and stored before the main crop is harvested. The practice of 'slipping' (the slips being cut from early plants without wilt or yellowing) is the best preventive of all sweet potato diseases.

STEVENS (N. E.). **Suggestions for a Pacific survey of Rice diseases.**—*Proc. fifth Pacif. sci. Congr., 1933*, iv, pp. 3239–3240, 1935.

In view of the great importance of rice as a staple food in the Pacific countries, the suggestion is made that, with the co-operation of the Plant Disease Survey of the United States Bureau of Plant Industry, a special committee should be appointed to undertake a Pan-Pacific survey of rice diseases.

Appended to this paper (pp. 3241–3246) is a list, compiled by Jessie I. Wood, of the bacterial, fungal, physiological, virus, and nematode diseases and parasitic phanerogams known to affect the crop.

[On p. 3343 it is stated that a resolution was passed voicing the wishes of members of the Congress to initiate a survey of rice diseases on the lines indicated, with the possibility of a subsequent extension of the undertaking to other crops.]

GIESECKE (F.) & LESCH (W.). **Versuche über die Wirkung eines kupferhaltigen Kalkmehls auf die Pflanzenproduktion.** [Experiments on the action of a copper-containing lime powder on plant production.] —*Landw. VersSta.*, cxxv, 3–4, pp. 229–234, 1936.

Mustard plants grown in pots on 'reclamation-sick' soil [*R.A.M.*, xv, p. 493] benefited from applications of a copper-containing lime powder, specially prepared from copper schist by H. Wölbling, at the rate of 14·7 or 29·4 gm. per pot, whereas the same treatment was without effect on those cultivated in a slightly loamy sand.

KOVAČEVSKI (I. C.). Бактериалният пригоръ по италианския Кимионъ. **Phytomonas cumini n.sp.** [Bacterial blight of Cumin, *Phytomonas cumini* n.sp.]—*Bull. Soc. bot. Bulgarie*, vii, pp. 26–44, 3 figs., 1936. [English summary.]

Cumin (*Cuminum cyminum*), the commercial cultivation of which is stated to be a comparatively recent development in southern Bulgaria, is severely attacked there by a bacterial blight affecting all the aerial organs of the plant. The first symptoms, usually appearing at the time of flowering on the stems, leaves, and inflorescences, are in the form

of narrow, green, water-soaked streaks, 2 to 4 mm. long, frequently coalescing together and soon turning brownish-yellow or dark brown, with a greasy appearance, and becoming covered with a white incrustation of bacterial ooze. The yield may be reduced in severe outbreaks by as much as 70 to 80 per cent. The distribution of the blight in the field is chiefly by rain-water. Isolations from diseased material yielded long rods with rounded ends, 1 to 3 by 0·5 to 0·7 μ in diameter, occurring singly, in pairs, or in chains and filaments. On potato agar it forms greyish-white, glistening, smooth, butyrous, circular, entire, and amorphous colonies. The organism is aerobic, Gram-negative, non-sporulating, green-fluorescent in Uschinsky's solution, without typical capsules, with one to three polar flagella (usually at one end only), rapidly liquefies gelatine, slowly peptonizes casein, does not coagulate milk, reduces litmus, does not hydrolyse starch or produce indol, hydrogen sulphide, or nitrates. Its minimum temperature for growth is below 5° C., the maximum about 31°, and the thermal death point about 47°. Its group number is 211.2322133. The bacterium is named *Phytomonas cumini* n.sp., and its pathogenicity to cumin and to dill (*Anethum graveolens*) was demonstrated by inoculation experiments, with subsequent reisolations. It closely resembles some green-fluorescent species of *Phytomonas*, especially *P. apii* [*Bacterium jaggeri*: *R.A.M.*, xiv, p. 143], from which it differs, however, in some cultural characters and chiefly in its pathogenicity.

Dodoff (D. N.) & Načeff (N. p.). Италианскиятъ Кимионъ въ България (**Cuminum cyminum L.**). (Предварителни бележки). [Cumin (*Cuminum cyminum* L.) growing in Bulgaria. (Preliminary notes.)]—Issued by *Min. Agric. Nat. Domains*, Sofia, 29 pp., 4 figs., 1936. [English summary.]

After a brief historical account of the introduction and cultivation of cumin (*Cuminum cyminum*) in southern Bulgaria, the authors discuss the diseases and pests which were found attacking the crop in 1934 in the vicinity of Assenovgradsk. A peculiar form of degeneration, believed to be caused by a virus, was observed at the Agricultural Experiment Station of Sadovo; it was characterized by a stunted appearance of the plants in scattered and more or less extensive patches in the field. The parts of the plant that develop after infection assume the form of witches' brooms, with small and distorted leaves bearing small, necrotic spots, and abnormal, sterile umbels, and eventually wither. Isolations from diseased tissues consistently remained sterile. Bacterial blight (*Phytomonas cumini*) [see preceding abstract] is stated to be economically the most important disease of the crop. Of the two varieties that are grown, namely, *C. cyminum* vars. *setosum* and *scabridum*, the former is locally considered the more susceptible but the apparent immunity of the latter is probably due to its greater height favouring a more rapid drying up of rain-water and dew. The disease was shown to be carried by the seed and preliminary experiments on seed disinfection have given promising results, but need further elaboration and confirmation. In some cases satisfactory control has been obtained by spraying affected plots with Bordeaux mixture. Powdery mildew (*Erysiphe polygoni*) [*R.A.M.*, xiii, p. 494]

was observed in several fields, in patches up to 15 m. in diameter. Both the conidial and perithecial stages of the mildew occur on the cumin and on the weed *Caucalis latifolia*, from which it is believed to have passed to the former. In moist, low-lying soil, cumin suffers from root rot and isolations from the affected tissues yielded several common soil-inhabiting fungi, such as *Fusarium* and *Rhizoctonia* spp., which, however, have failed so far to reproduce the condition in inoculation tests.

Săvulescu (T.) & Rayss (T.). **Contribution à l'étude de la mycoflore de Palestine.** [A contribution to the study of the mycoflora of Palestine.]—*Ann. Cryptog. exot.*, viii, 1–2, pp. 49–87, 12 figs., 1935. [Received July, 1936.]

This annotated list of 114 fungi collected by the author and other workers in Palestine includes *Sphaerotheca pannosa* on rose, *Podosphaera leucotricha* on apple, *Leveillula* [*Oidiopsis*] *taurica* [*R.A.M.*, xv, p. 587] on artichoke (*Cynara scolymus*), *Exoascus* [*Taphrina*] *deformans* and *Polystigma ochraceum* on almond [ibid., xv, p. 557], *Lophodermium pinastri* [ibid., xv, p. 473] on *Pinus halepensis*, *Septoria apii* on celery, *S. graminum* [ibid., xiii, p. 434] on *Triticum durum*, *S. antirrhini* on *Antirrhinum majus* [ibid., xi, p. 329], *Clasterosporium carpophilum* on peach, *Cercospora lingelsheimi* Săvul. & Rayss. n. comb. [a new name for *C. calotropidis* Lingelsh., the specific name being already occupied] on leaves of *Calotropis procera*, *C. smilacina* forma *asperae* on *Smilax aspera*, *Cercosporina ricinella* on *Ricinus communis* seedlings [ibid., xii, p. 247], *Heterosporium gracile* [*Didymellina macrospora*] on *Iris germanica* [ibid., xiv, p. 698], *Sphacelotheca sorghi* present everywhere on sorghum, *Puccinia asparagi* on asparagus, *P. purpurea* on *Sorghum halepense*, *Phragmidium disciflorum* [ibid., xiii, p. 185] on leaves of cultivated roses, *Uromyces appendiculatus* on cowpea, *U. fabae* on bean (*Vicia faba*) [ibid., xv, p. 552], *U. formosus* on cultivated *Dianthus*, *Tranzschelia* [*Puccinia*] *pruni-spinosae* [ibid., xv, p. 590] on *Anemone coronaria*, almond, myrobolan, and *Prunus pissardi* [*P. divaricata*], *Physopella* [*Cerotelium*] *fici* on fig [ibid., xiv, p. 560], *Melampsora allii-populina* on *Populus nigra* [ibid., xv, p. 529], *M.* [*Melampsorella*] *ricini* on *Ricinus communis* [ibid., iv, p. 590], and *Rhizopogon luteolus* on *Pinus halepensis*. *Helminthosporium palaestinum* n.sp. [with a Latin diagnosis] is recorded as parasitic on stems and leaves of cultivated species of *Dianthus*. The pale or subhyaline, 5- to 7-septate conidiophores arise in bundles of 8 to 16, and measure 30 to 160 by 6 to 8 μ; the conidia are 5- to 7-septate, somewhat straight or curved, tapering towards the apex, pale-olivaceous, and 60 to 120 by 9 to 12 μ.

Chow (C. H.). **A miscellaneous collection of fungi in the National Normal University of Peiping.**—*Bull. Fan Inst. Biol. Peking*, vi, 2, pp. 30–36, 1935. [Chinese summary. Received August, 1936.]

The following are among the items of interest in this annotated list of 32 fungi (mostly edible) collected in different parts of China, for which about half the number are new records. *Cordyceps sinensis* [*R.A.M.*, xi, p. 372], which occurs in profusion in Sikang Province, is

valued for its medicinal properties and some 10,000 kg. are exported annually at $7 Mex. per kg. *Tremella fuciformis*, a product of Szechuan and the vicinity, is esteemed for similar reasons and is rated at $10 Mex. per kg. *Armillaria edodes*, one of the most popular edible fungi of China and Japan, must be differentiated from *A. matsutake* [ibid., xv, p. 554], to which the former name has erroneously been applied. Ito and Imai proposed (*Bot. Mag., Tokyo*, xxxix, p. 319, 1925) to transfer *A. edodes* to *Cortinellus* as *C. berkeleyanus*, but this transference is deemed unacceptable and the name *A. edodes* should, therefore, be retained. *Ustilago zeae* was collected from a female maize inflorescence.

Chow (C. H.) & Chen (H. K.). **On the variation of Ganoderma lucidum (Fries ex von Leysser) Karsten.**– *Bull. Fan. Inst. Biol. Peking*, vi, 2, pp. 36–41, 1 pl., 1935. [Chinese summary. Received August, 1936.]

Based on a comparative examination of six Chinese specimens of *Ganoderma lucidum* [*R.A.M.*, xiv, p. 611 *et passim*], the writers give a revised English diagnosis of the fungus, stated to differ from former descriptions only in one feature, namely, the occasional yellow coloration of the subsurface of the pileus. The dimensions of the densely verrucose, brown endospores are given as 8 to 10·5 to 12·5 by 6 to 7·5 to 9 μ. Neither *Fomes japonicus* nor *G. lucidum* var. *japonicum* is considered to differ sufficiently from *G. lucidum* to justify separation and these names should therefore be added to the already existing list of 13 synonyms.

Ling (L.). **Polyporaceae of China listed in the publications of the Science Society of China.**—*Proc. fifth Pacif. Sci. Congr., 1933*, pp. 3246–3250, 1935.

A list is given of the 103 Polyporaceae so far known to occur in various parts of China, with explanatory notes in certain cases. *Fomes fulvus* [*R.A.M.*, xii, p. 302] is stated to be very prevalent in the peach, plum, and cherry orchards of Nanking, Peiping [Peking], and Szechuan. Four new species [without diagnoses] are included in the list.

Raillo (Mme A. I.). Диагностическая оценка морфологических и культуральных признаков у видов рода **Fusarium.** [Diagnostic evaluation of the morphological and cultural characters in the genus *Fusarium*.]—*Bull. Pl. Prot. Leningr., 1935*, Ser. ii (Phytopath.), 7, pp. 5–100, 11 pl., 7 figs., 1935. [English summaries, pp. 37, 78–79. Received June, 1936.]

In the first part of this paper the author indicates the difficulties inherent in Wollenweber's [*R.A.M.*, x, p. 626] and Wollenweber's and Reinking's [ibid., xv, p. 321] classification of the genus *Fusarium*, claiming that these are chiefly due to the fact that most of the characters used by them in establishing their system are casual and insufficient for diagnostic purposes. She then gives a detailed and fully tabulated account of her own studies of the morphological and cultural properties of 17 species of *Fusarium*. All the fungi were studied under standardized conditions on ordinary potato (var. Centifolia) or acid potato agar at 22° to 23° C. in diffuse light, and their pigmentation on

rice or potato slices. The records were made according to a standard method and the results, which were tested statistically, indicated that the only morphological character of diagnostic value distinguishing the species is the shape of the apical cell of the conidia derived from pionnotes, pseudopionnotes, or sporodochia, as the conidia borne on aerial mycelium are too variable to be of any use. Such characters as the curvature of the conidia, the number of septa, width of the conidia, and the length of the apical cell can only serve to distinguish subspecies, varieties, or subvarieties, while cultural characters such as pigment, presence of sclerotia, and mode of spore formation are only indicative of forms. The data thus obtained are used in an attempt to outline a theoretical structure of the species in the genus *Fusarium* comparable with that already introduced into the classification of the phanerogams by Vavilov and other Russian authors, and which in the author's opinion should considerably simplify the present classification of the genus.

In the second part, the author describes her studies on the variability of the morphological and cultural behaviour of different single-spore isolates from single-spore cultures of the different species, the results of which showed that the shape of the apical conidial cell, the prevailing number of septa, and the shape of the curvature of the conidia remain constant in all the isolates derived from single-spore cultures. The length and width of the conidia, on the other hand, as well as the cultural characters, varied considerably in the isolates. On the whole, these results are considered to confirm the relative taxonomic value of the different characters as indicated in the first part of the paper.

CARRERA (C.). **Fusarium de la República Argentina. Estudio y clasificación de algunas especies.** [*Fusarium* in the Argentine Republic. A study and classification of certain species.]—*Physis, B. Aires*, xii, 41, pp. 43–47, 1936.

An annotated list is given of ten species of *Fusarium* infecting plants in the Argentine, a preliminary note on which by J. Marchionatto has already appeared [*R.A.M.*, xiv, p. 720].

SIDERIS (C. P.). **Characteristic plant and fruit diseases of tropical plants caused by Pythiaceous parasites.**—*Proc. fifth Pacif. Sci. Congr., 1933*, iv, pp. 3329–3335, 1935.

Notes are given on the distribution and host range of *Nematosporangium* [*Pythium*] *aphanidermatum* [*R.A.M.*, xiv, pp. 498, 743; xv, p. 587] *P. de Baryanum*, *Phytophthora palmivora*, and *P. parasitica*, followed by an account of certain tropical plant diseases caused by Pythiaceous fungi, particulars of which have been given from time to time in this *Review*. The paper concludes with a brief discussion on the physiological aspects of parasitism by this group of fungi.

Het gebruik van zwavel bij de bestrijding van zwarte wortelschimmel bij de Theecultuur (Rosellinia arcuata en R. bunodes). [The use of sulphur in the control of black root rot in Tea cultivation (*Rosellinia arcuata* and *R. bunodes*).]—*Ind. Mercuur*, lix, 9, pp. 115–116, 1936.

Recent experiments at the West Java Experiment Station (*Korte*

Meded. 45) have shown that the ordinary method of sulphur application (by strewing) for the control of *Rosellinia arcuata* and *R. bunodes* in tea plantations [*R.A.M.*, xii, p. 425] should be replaced by the more economical practice of mixing the disinfectant with the soil in the plant holes. It is not necessary to dig holes larger than $\frac{1}{15}$ to $\frac{1}{12}$ cu. m. and the quantity of sulphur required per hect. is about 1,270 kg. for a spacing of 3 by 4 ft. or 760 kg. for one of 4 by 5 ft., costing Fl. 64 or 38, respectively. The corresponding figures for the strewing method are 5,000 to 10,000 kg. sulphur per hect. (Fl. 250 to 500). More thorough eradication of old root stumps is also advocated.

Van der Meer Mohr (J. C.). **Verslag van het Deli Proefstation over het jaar 1935.** [Report of the Deli Experiment Station for the year 1935.]—*Meded. Deli-Proefst.*, Ser. 2, xciv, 53 pp., 1936.

The following are among the items of phytopathological interest in this report. Rotterdam B disease [*R.A.M.*, xv, p. 403] occurred in a virulent form in newly transplanted tobacco and the available evidence is now stated to point definitely to its transmission through the soil.

The incidence of slime disease [*Bacterium solanacearum*: ibid., xiv, p. 658] was reduced by 19 per cent. by cultivation on ground previously occupied by *Mimosa* [*invisa*: ibid., ix, p. 349] and lalang [*Imperata arundinacea*], which is regularly burnt off, whereas an increase of 24 per cent. was observed in the plots following the broad-leaved *Macaranga tanarius*. Moderate applications of lime were also beneficial in minimizing the amount of slime disease, but the advantages of this treatment are counteracted by its tendency to deplete the potash content of the soil and to cause top rot, the cure of which necessitates three applications of 6 mg. boric acid per plant [ibid., xiii, p. 659]. Sulphur was only effective when applied to the soil in such quantities as to induce a strongly acid reaction (P_H 4·5 or thereabouts), whereby the essential nutrient elements are exhausted and a reasonably good harvest becomes impracticable. The beneficial effect of single superphosphate on slime disease in tomato seedlings [ibid., xiv, p. 658] was found to be connected with its high (50 per cent.) gypsum content.

Thung (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag i Mei 1934–30 April 1935.—*Meded. Proefst. vorstenl. Tab.* 82, pp. 27–35, 1936.

Mosaic was again responsible for severe damage in the Vorstenland (Java) tobacco plantations [*R.A.M.*, xv, p. 533] during the period under review, but an improvement in the situation seems likely to result from the use of a 4 per cent. formalin solution for cleansing the coolies' hands prior to thinning out the seedlings and transplanting. Studies are in progress on the mode of dissemination of the special form of mosaic characterized by wispy leaves [ibid., xiii, p. 806], in the transmission of which insects are believed to be involved. Extensive soil infestation was responsible for virulent attacks of *Phytophthora* [*parasitica nicotianae*: ibid., xiv, p. 533], which was evidently distributed with insufficiently fermented stable manure as well as by means of water. Soil disinfection with chemicals proved impracticable.

Of the various methods tested for the control of mildew (*Oidium*) [*Erysiphe cichoracearum*: loc. cit.], the application of sulphur to the soil gave the most promising results, delaying the appearance of the fungus though not preventing its ultimate development. Spraying the plants with shirlan [cf. ibid., xii, p. 744] was effective on a small scale but its extended use was not found to be feasible.

Confirmation was obtained of the correlation observed in previous years between precipitation and the outbreak of leaf spot [*Cercospora nicotianae*: ibid., xv, p. 403], the disease being practically absent in a season of almost unbroken drought preceding the commencement of the rains at the end of October.

Vinson (C. G.) **Virus diseases of plants. Purification of the virus of mosaic disease of Tobacco.**—*Res. Bull. Mo. agric. Exp. Sta.* 237, 16 pp., 1936.

In continuation of his studies on the precipitation of viruses by safranin [*R.A.M.*, xii, p. 332] the author describes a series of experiments, the results of which showed that with increasing concentrations of safranin the virus of tobacco mosaic from the sap of diseased plants was progressively carried down until precipitation was approximately complete. Acetone precipitation of the virus in the fraction obtained on decomposing the safranin precipitate [ibid., viii, p. 407] gave incomplete results, but re-precipitation of the virus with safranin was successful. A few drops of a normal solution of aluminium sulphate precipitated the virus from the fraction obtained on decomposing the safranin precipitate, as also did careful acidification; such precipitates were readily dispersed by lowering the hydrogen-ion concentration. The nitrogen content obtained in the virus fraction from 500 c.c. of juice of diseased tobacco plants, using the lead acetate procedure, was about 10 mg.; very little or no nitrogen was detectable in corresponding samples from healthy plants [ibid., xi, p. 406]. Hydrogen sulphide was found capable of decomposing the lead acetate-virus precipitate suspended in a dilute solution of neutral phosphate without injury to the virus. In a test of the effect of ageing on the various preparations, the lead and safranin precipitates still yielded highly infectious fractions after six months.

Moore (E[nid] S.) & Smith (A. J.). **Pests and diseases in Tobacco seedbeds. II. Disinfecting seed and seedlings.**—*Fmg S. Afr.*, xi, 122, pp. 194–195, 1 fig., 1936.

Directions are given for the disinfection of tobacco seed against wildfire [*Bacterium tabacum*] and virus and other diseases [*R.A.M.*, xv, p. 613] by immersion for 15 minutes in 1 in 16 commercial formalin at the rate of 1 oz. per 4 oz. seed, and the selection, preparation, and care of seed-beds, including soil sterilization by various methods adapted to the particular end in view, and frequent applications of 4–4–50 Bordeaux mixture plus lead arsenate (1½ oz. per 4 galls. spray); 3 galls. of spray should amply suffice for the requirements of 10 sq. yds. of seed-bed for the duration of the season. In the light of present knowledge of the 'kromnek' disease it is advisable to choose sites for tobacco beds at a safe distance from flower and vegetable gardens,

especially those containing potatoes and onions. The most extensive spread of mosaic is liable to occur at the time of transplanting, when all diseased plants should be rogued and the bed sprayed with Bordeaux mixture.

Güssow (H. T.). **Plant quarantine legislation—a review and a reform.**—*Phytopathology*, xxvi, 5, pp. 465–482, 1936.

Following a critical review of the present status of plant quarantine legislation as reflected in the three outstanding measures now in operation—the total embargo, health certificates, and restrictive regulations—the writer suggests the adoption of certain far-reaching reforms, including the organization in all countries of adequate plant disease surveys, stringent supervision of exports, improved methods of port-of-entry inspection, agreements among groups of countries of similar commercial interests and geographical location, international co-operation in scientific research, and the establishment, under the auspices of the League of Nations, of an international advisory council on plant quarantines.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSch Dienst*, viii, 2, p. 57, 1936.

Chile. An amendment of 29th May, 1935, to the plant protection regulations of 31st December, 1924, permits the importation from the United States under appropriate safeguards of peach plants free from peach yellows, rosette, and little peach.

Resolución suprema del 3 de enero de 1936 prohibiendo la importación de plantas de Plátano. [A supreme Decree of 3rd January, 1936, prohibiting the importation of Banana plants.]—*Sanid. veg. Min. Agric. Peru*, p. 122, 1936.

In order to prevent the introduction into Peru of the Panama disease of bananas (*Fusarium* [*oxysporum*] *cubense*) the importation of all banana plants or parts thereof is absolutely prohibited as from 3rd January, 1936.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 6, pp. 129–131, 133–134, 137, 1936.

Australia (Commonwealth of). Quarantine Proclamation No. 4 P of 17th September, 1935, contains a list of 124 fungi, bacteria, and viruses the exclusion of which from Australia it is proposed to effect by prohibiting the importation of any articles likely to harbour these organisms, except in accordance with the Quarantine (Plants) Regulations.

Spain. Details are given of the regulations embodied in a Decree of 31st January, 1936, defining the scope and functions of the Spanish phytopathological inspection service, which will be responsible for the examination of agricultural products both for import and export.

Peru. A Resolution of 2nd January, 1936, prohibits the exportation from mosaic-infested sugar-cane plantations of the Santa Catalina Valley [ibid., xiv, p. 736] of cuttings either for planting or consumption in other parts of the Republic or for the market.